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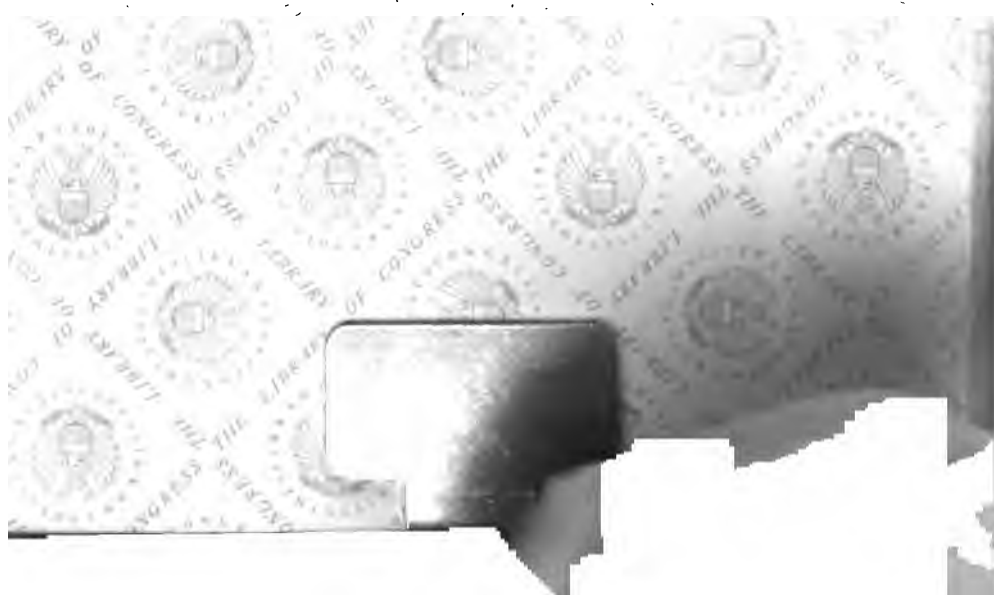
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HEARINGS

BEFORE THE

U. S. Congress, House.

SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,

HOUSE OF REPRESENTATIVES,

CONSISTING OF

MESSRS. HAINER, GROUT, HEMENWAY, LIVINGSTON, AND
BARTLETT OF NEW YORK,

IN CHARGE OF

THE FORTIFICATION APPROPRIATION BILL.



WASHINGTON:

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FORTIFICATION APPROPRIATION BILL.

HEARINGS CONDUCTED BY THE SUBCOMMITTEE, MESSRS. E. J. HAINER, CHAIRMAN, W. W. GROUT, J. A. NEMENWAY, L. F. LIVINGSTON, AND FRANKLIN BARTLETT, OF THE COMMITTEE ON APPROPRIATIONS, HOUSE OF REPRESENTATIVES, IN CHARGE OF THE FORTIFICATION APPROPRIATION BILL, ON THE DAYS FOLLOWING, NAMELY:

MONDAY, March 2, 1896.

Gen. William P. Craighill, Chief of Engineers, accompanied by Capt. W. M. Black, of the Corps of Engineers, appeared before the committee.

STATEMENT OF GEN. WILLIAM P. CRAIGHILL, CHIEF OF ENGINEERS.

The CHAIRMAN. The subcommittee has under consideration the general fortification bill. We have present with us this morning General Craighill and Captain Black, of the Engineer Corps, and we will now listen to General Craighill, who will make such statements as he deems necessary for the work of this committee, having in view of course, the estimates before the committee.

Mr. LIVINGSTON. I would suggest that we take up the bill item by item.

General CRAIGHILL. I supposed, gentlemen, the object I came for to-day was to answer questions in reference to the estimates submitted in the regular way. Since they were submitted, as the chairman of the committee has told me just now, some of the members have read my testimony before the Coast Defense Committee of the Senate, by which the scope of my expectations, at any rate my hopes at least, have been enlarged. But I think probably the better course would be for me to answer questions. I did not come here expecting to make a speech or anything of that sort.

The CHAIRMAN. We will be pleased to have you give such general consideration regarding this bill as may occur to you, and especially define clearly the portion of this bill which relates to the Engineer Corps and consecutively and comprehensively taking up that branch of it.

Mr. LIVINGSTON. If you do not mind, I would like to ask one or two questions before you begin.

The CHAIRMAN. I would like to have your general statement defining the work of the Engineer Corps in the first instance, as I deem it highly of importance and I trust that course will be taken, and clearly define the work of the Engineer Department. I notice in this connection, before the Committee on Coast Defenses in the Senate, there seems to have been an attempt to cover with the General the entire subject of coast defenses, including in his examination matters of which he was not prepared to speak and could not with propriety speak, and, therefore, I wish him in the first instance to define the connection of the engineering work in this matter in order that we may understand it.

General CRAIGHILL. The Corps of Engineers is charged by law and regulations with the construction of the land defenses of the country. That is to say, the platforms upon which the guns and mortars are mounted, the parapets which are to cover them, and the magazines which are to contain the ammunition, and all minor accessories in reference to those particular points. The production of the guns and carriages which we mount is by the Ordnance Department, but we work together, although in separate lines. That is to say, there is an understanding always between the Ordnance Department and the Engineer Department as to the needs of each. Of course it is useless to have platforms if we have not the guns and mortars to put upon them; also the guns and carriages have no use unless we have the platforms upon which to put them. So that the two Departments run in parallel lines, if I may use that expression, and perhaps I may now distinctly, after this general statement, define the duty of the engineer branch, which is to construct the platforms on which the guns are to be mounted, the parapets which are in front of them for their protection, and the magazines for the holding of the ammunition which is to be served. Those are the important points of the batteries. Then there is another important branch of the defense, the torpedo defense, which is also entirely in the hands of the Engineer Department.

The CHAIRMAN. The emplacements then come exclusively within your Department?

General CRAIGHILL. Yes, sir; and the estimates I submit to this Congress relate entirely as you see from the items of them to those particulars I have mentioned

the Ordnance Department being left to make their own estimates, there always being an understanding between the two Departments.

The CHAIRMAN. What, if anything, have you to do with the floating batteries?

General CRAIGHILL. We have nothing to do with those.

The CHAIRMAN. Your work, then, is confined exclusively to land?

General CRAIGHILL. To the land defense, except so far as to torpedoes in the water, which are always in the vicinity of the batteries, and which for their proper usefulness should be always under the fire of the guns. A torpedo, unless it is under fire, is of very little use, because the enemy can take it up, cut the cable, and the efficiency of the torpedo is at once neutralized.

The CHAIRMAN. Now, in this connection will you state generally the present condition of the fortification work which you have already completed and in process of completion?

General CRAIGHILL. I do not know that I can give a better view of it than this: In general terms, the Endicott Board is well known as a general board consisting of officers of the Army and Navy, instituted by a former Secretary of War, Mr. Endicott, about ten or fifteen years ago, which made an entire review of the fortifications of the country. They specified the most important ports of the United States which should be occupied and they gave estimates for the occupation of those ports. That has been the basis of the consideration of the subject ever since. Of course studies have been going on and we have been taking advantage of the very costly experiments in Europe and experiments in our own country in reference to matters of that sort, so that we have now arrived at a condition where we have the plans of defense ready, and all we want is the money to go to work and build them; and I will say that since the Endicott Board was in existence, although their estimate was, exclusive of floating defense, about \$100,000,000, in that time the Congress has given to the Engineering Department \$3,500,000. I can not give you a better estimate of the condition of our defense than a comparison of those two figures, that is, the relation of \$3,500,000 to \$100,000,000.

Mr. LIVINGSTON. In this bill your Department is only interested down to page 2; you go down to "preparation of plans and fortifications." "Sea walls and embankments" you have nothing to do with?

General CRAIGHILL. Yes, sir; those are the sea walls and embankments around our forts.

The CHAIRMAN. How far do you go in this bill, to torpedoes and harbor defense?

General CRAIGHILL. Yes, sir.

The CHAIRMAN. Do you mean to say that the Endicott Board suggested or recommended \$100,000,000 for the Engineer Department?

General CRAIGHILL. That includes the Ordnance Department also, and I should have made that statement, and I can tell you also what the Ordnance Department have had. They have had a little over \$7,000,000.

The CHAIRMAN. As a matter of fact about \$20,000,000 in the aggregate has been appropriated, as I understand it, for the entire scheme?

General CRAIGHILL. No, sir; I do not so understand it. I understand it to be \$10,000,000. I do not think I can be mistaken about those figures. We have the precise figures here—\$3,500,000 for the Engineer Department and \$7,000,000 for the Ordnance Department.

The CHAIRMAN. And the total for the entire scheme as recommended by the Endicott Board is—I have the figures before me—a trifle over \$126,000,000?

General CRAIGHILL. In fairness, it ought to be stated that about \$26,000,000 is for floating defense, with which we have not anything to do.

The CHAIRMAN. The report of the Endicott Board was made January 16, 1886?

General CRAIGHILL. Yes, sir.

The CHAIRMAN. So, since 1886 there has been about \$10,500,000 appropriated?

General CRAIGHILL. Yes, sir. I have here before me the figures which I used before the Coast Defense Committee of the Senate indicating precisely the division of the estimates of the Endicott Board.

The CHAIRMAN. Will you kindly make that a part of your statement?

General CRAIGHILL. I will read them if you wish. For the Engineer Department \$55,500,000 is estimated; then relating to the armament, which is the Ordnance Department, \$38,000,000 is estimated; for torpedo defense, \$4,500,000; for floating batteries, about \$19,000,000, and for torpedo boats, which are under the direction of the Navy also to some extent, about \$10,000,000. I am using round numbers, but I have the details here, and the appropriations that have been made since are, for the Engineer Department, \$3,500,000; for Ordnance Department, for guns and carriages, \$7,000,000.

The CHAIRMAN. Your reference to the estimates of the Endicott Board are found on page 28 of their report?

General CRAIGHILL. I have not the report of the Board before me, but those figures are taken from that. They were made up by Captain Black. This is a subdivision which was prepared in my office under Captain Black.

Captain BLACK. They were taken right from those figures.

General CRAIGHILL. We have a great deal of detail which, of course, the committee do not care to go into, probably.

GUN AND MORTAR BATTERIES.

The CHAIRMAN. Have you anything to do with gun and mortar batteries?

General CRAIGHILL. Gun and mortar batteries are the batteries we build.

The CHAIRMAN. That brings us to the first item in the appropriation bill?

General CRAIGHILL. Yes, sir. That is for the construction of gun and mortar batteries, \$1,815,000, and I have here, if the committee wishes to see it, the localities in which those are to be placed.

The CHAIRMAN. So far as it may be proper to state them, you will please give them.

General CRAIGHILL. I have not only the total for the localities, but the number of guns which are to be provided at each locality.

The amount asked for in the estimate, by enabling partly finished work to be completed and new emplacements to be constructed, will provide emplacements for the following guns:

Three 12-inch guns on nondisappearing carriages.

Nineteen 10-inch guns on disappearing carriages.

Nine 8-inch guns on disappearing carriages.

Thirty-two 12-inch mortars.

The emplacements will be built at the more important ports, where it is considered defense is most required.

General CRAIGHILL. The next or second item is for the construction of gun and mortar platforms and the estimate is \$70,000.

Mr. LIVINGSTON. Before you go to that I want to ask how much of the \$400,000 for gun and mortar batteries for 1896 is unexpended?

Mr. CANNON (simultaneously). Now the work you have given us in those two tables is work which you would do in the coming year if you had the full amount of money?

General CRAIGHILL. Yes, sir.

Mr. CANNON. If you get the guns and mount them; but is it practical to furnish you with the guns and carriages to enable you to make these emplacements?

General CRAIGHILL. Yes, sir.

Mr. LIVINGSTON. Is this \$70,000 in the second item a reasonable proportion of the \$1,815,000; will that carry all the gun and mortar platforms you want? Suppose you get the \$1,815,000 for guns and mortar batteries, would \$70,000 furnish the platforms for all of them?

General CRAIGHILL. Those two items really, gentlemen, should be consolidated.

Mr. LIVINGSTON. Allowing you to pay out of the whole fund?

General CRAIGHILL. Yes, sir. The gun and mortar platforms are really a part of the gun and mortar batteries, and I have not been able to fathom yet why my predecessor separated those items, but he had some reason, I have no doubt, but at this time I do not see it. and my belief is that \$70,000 should be added to the \$1,815,000, and that the title should be simply, "For the construction of gun and mortar batteries," because that really includes the other.

Mr. LIVINGSTON. The point is this, if you expend the \$1,815,000 and expend the \$70,000 and find you do not have platforms enough for the guns and mortar batteries, you could not draw upon the other fund as the bill stands now, and for that reason I think you are right on that point and the two ought to be combined.

General CRAIGHILL. Yes, sir; and the word "platform" should be omitted entirely, and it should be "for the construction of gun and mortar batteries," and it should be the total of those two sums. We followed the phraseology of the previous law, of which we have a copy, in making the estimates.

The CHAIRMAN. Would it not be well to say "for the construction of gun and mortar batteries, including platforms?"

General CRAIGHILL. It is not necessary to include "platforms" because the battery includes the platforms, but that is the way the appropriation was made in previous years and we followed the phraseology of the previous bill, but after a careful consideration there is no good reason for it because a platform is a part of the battery.

Mr. LIVINGSTON. If we combine this appropriation under the head of "construction of gun and mortar batteries" it will be all right?

General CRAIGHILL. Yes, sir; so you cover the two sums. Now I hope the gentlemen of the committee understand when I talk about these estimates I am entirely committed to the testimony that I have previously given that we can expend a great deal more than this if we can have it, as my testimony has been before the Coast Defense Committee of the Senate. This is the minimum sum we ought to have to go forward with, but if we want to make good progress with our fortifications you should give us about \$1,000,000 a month for the engineering work alone. That is the conclusion to which I have come after a very careful consideration of the whole

subject, and as I have endeavored to explain very fully in my testimony before the Coast Defense Committee I will repeat it here in order that there might be no misunderstanding in these estimates.

Mr. CANNON. Is not this what you want really in this examination: Do you not want first to exhaust the estimates, and then when you get these exhausted and see how many guns it will mount and what it will do, why then are you not ready, as a separate proposition, to take up what you could do additionally which you have not estimated for? In other words, the bill in this connection for all practical purposes is all blended together and becomes compensated, but if you just keep to the estimates and get it from that standpoint, then you can take it up from another.

The CHAIRMAN. That is my purpose in directing the examination in the first instance, and confining it, in the first place, to a definition strictly of the duties of the Engineer Corps, and then, secondly, taking up this bill seriatim and exhaust the subjects properly included in the bill, and then let him offer additional considerations.

General CRAIGHILL. What I have said hitherto was on that line?

Mr. LIVINGSTON. What amount of the \$400,000 appropriated for last year was expended?

General CRAIGHILL. The only statement that I would like to make in connection with these estimates now before the committee is that they are, in my judgment, the minimum amount that we should have for the successful prosecution of our work on fortifications for the next fiscal year.

Mr. LIVINGSTON. I want to know how much of that \$400,000 you have expended. What did you do with that \$400,000?

General CRAIGHILL. You want to know the distribution of that appropriation?

Mr. LIVINGSTON. Yes, sir.

Captain BLACK. The appropriations as they are made are run together, and we have a table of the appropriations up to date which shows what has been done and the balance remaining on hand.

General CRAIGHILL. The appropriation for fortifications, as those for rivers and harbors, are not fiscal appropriations, although we make estimates for the fiscal year, but they are available all through.

Mr. LIVINGSTON. Until expended. Let me ask this question—

General CRAIGHILL. I think my explanation will perhaps help you. That is to say, it is very difficult for us without a good deal of labor to say exactly what has been done with that \$400,000, because it is in with balances remaining over from previous appropriations, although we could get it out of the records and get it exactly.

Mr. LIVINGSTON. What money have you got for construction of guns and mortar platforms irrespective of the \$400,000; how much have you unexpended?

General CRAIGHILL. The balances remaining unallotted from the total appropriations of \$3,500,000 of which I spoke are as follows:

Gun and mortar batteries:	
Appropriations to date.....	\$3, 271, 000. 00
Available balance.....	9, 342. 20
Gun and mortar platforms:	
Appropriations to date.....	250, 000. 00
Available balance.....	12, 516. 08

These balances are being depleted daily, and will be exhausted completely at an early date. As works under construction are completed the small balances of allotments for them which remain are consolidated with the unallotted balances given above, and are available for new works or for the completion of works under construction.

The above balances are required for works now under construction for which the earlier allotments have proved insufficient.

The CHAIRMAN. What has been done in the line of construction of gun and mortar batteries? What is the net result accomplished thus far?

General CRAIGHILL. We have the figures here and we can give them to you.

12-inch guns.—One gun lift for two 12-inch guns, completed and guns mounted. Two lifts for three 12-inch, each foundation started. Six emplacements for 12-inch guns on non-disappearing carriages, completed.

10-inch guns.—Nine emplacements for 10-inch guns on disappearing carriages, completed. Thirteen emplacements for 10-inch guns on disappearing carriages, under construction, with funds sufficient to compete. One emplacement, under construction, without funds sufficient to complete.

8-inch guns.—Five emplacements for 8-inch guns on disappearing carriages, com-

pleted. Two emplacements for 8-inch guns on disappearing carriages, under construction, with funds sufficient to complete.

12-inch mortars.—Four batteries of sixteen 12-inch mortars, each completed. Two batteries of sixteen 12-inch mortars, each under construction, with funds sufficient to complete half of each.

LIFTS FOR GUNS.

The CHAIRMAN. In regard to lifts, what have you to say in respect to those? I observe in your testimony before the Committee on Coast Defenses of the Senate that your general statement was that they were very expensive and perhaps impractical.

General CRAIGHILL. The only lifts we have already constructed are at Sandy Hook. There are two 12-inch guns mounted on hydraulic lifts there, and they cost about \$250,000 a gun, which is very expensive in my judgment, and I believe that they can be replaced by a cheaper method—that is to say, by the disappearing carriage, and our efforts are directed in that direction now.

Mr. CANNON. Now, what would a disappearing carriage cost for a 12-inch gun?

General CRAIGHILL. Well, that is a detail of the Ordnance Department. It is not the carriages which cost so much as the machinery, etc., for using it.

Mr. CANNON. Just a rough guess?

Captain BLACK. The entire thing, without counting in the cost of the gun, would be about \$90,000 for the emplacement and carriage.

Mr. CANNON. As against \$250,000?

Captain BLACK. Yes, sir.

General CRAIGHILL. You see there will be an enormous saving if that can be accomplished; and I think it can.

The CHAIRMAN. The estimate of the Endicott Board was based on a large number of lifts being used instead of carriages?

General CRAIGHILL. If you will permit me to wander away from these estimates for a moment, you will find in the estimates I have submitted to the Coast Defense Committee of the Senate the Endicott estimates have been modified very much, but we have introduced also another expensive item which is not in the estimate of the Endicott Board, which is Puget Sound, for which they made no estimate at all.

EMPLACEMENTS COMPLETED.

The CHAIRMAN. Coming back to the gun and mortar batteries, can you briefly collate the figures and give us the number of guns and mortar batteries which have already been constructed; I mean in the gross?

General CRAIGHILL. There are some in the process of construction now, which are unfinished.

The CHAIRMAN. But I want the total number completed.

Captain BLACK. Two 12-inch guns mounted on lifts, one 12-inch mounted on disappearing carriage, one 8-inch mounted on disappearing carriage, and 64 mortars. Those are all mounted and ready for action.

EMPLACEMENTS PARTIALLY COMPLETED.

In addition, the following works are completed, except in minor details, and are ready for their guns and carriages:

Five emplacements, 12-inch guns on barbette carriages.

Nine emplacements, 10-inch guns on disappearing carriages.

Four emplacements, 8-inch guns on disappearing carriages.

The CHAIRMAN. Now, under the plan which has been suggested, what are the total number of guns and mortars required?

General CRAIGHILL. For the whole United States?

Mr. GROUT. For the whole coast.

The CHAIRMAN. For the whole coast as you have under plan.

EMPLACEMENTS, TOTAL CONTEMPLATED.

General CRAIGHILL. We have not those figures here—that is, the total—but I can readily supply them in the testimony when it is sent to me for revision.

Thirty-six 16-inch guns, two hundred and three 12-inch guns, one hundred and eighty 10-inch guns, ninety-eight 8-inch guns, three hundred and sixty rapid-fire guns, one thousand and thirty-two 12-inch mortars, twenty-four 10-inch mortars.

The CHAIRMAN. What is the number of these guns and mortars under process of construction at the present time?

General CRAIGHILL. You mean guns, mortars, and carriages?

The CHAIRMAN. Yes; that are now in process of construction—I see those given in another place. Is there any portion of the construction of these guns and mortar batteries under contract, or any part to be done under contract?

General CRAIGHILL. As a rule work of this sort has not been done under contract, and it is for the reason that the amount available for any particular locality has been so small that it was hardly worth while to do so; but my judgment is that if we have a large appropriation for fortifications we should apply to the construction of our batteries, as far as possible, the system that we have used with so much advantage to rivers and harbors, which we call the continuous contract system. It is certainly economical and certainly advantageous in every way.

CONTRACT SYSTEM—GUN AND MORTAR BATTERIES.

The CHAIRMAN. The estimates you have made here under these two estimates consolidated is \$1,885,000 for guns and mortar batteries, including platforms. Will that enable you to put their construction under the continuing contract system?

General CRAIGHILL. Well, I think not. No, we would want more money. This \$1,800,000 is so distributed all over the United States that I would not undertake to try the continuous system on the basis of these estimates, although we might use contracts in certain localities where we have to expend a larger proportionate amount; but you understand this sum is to be spread over the whole coast of the United States, and when we limit the different items to different localities it dwindles down so that the continuous contract system is not available although we do make contracts for some of the elements, such as cement, sand, and things of that sort.

Mr. LIVINGSTON. If we should not give you the \$1,885,000; but suppose we gave you \$600,000, how could you spread that all along this coast line?

General CRAIGHILL. Those are figures I read to you some time ago.

Mr. LIVINGSTON. Will you simply construct fewer gun emplacements at each point or confine the appropriations to one part of the coast line?

General CRAIGHILL. I read to the committee the details of the distribution of that sum.

Mr. LIVINGSTON. I understand; but suppose we did not give you the \$1,885,000, but gave you about half of that, what would you do with it?

General CRAIGHILL. We would distribute it relatively, just the same way, probably, in so far as the appropriation is capable of subdivision. Enough must be given to each work to give some results there, with regard to efficiency of work done and economy of construction.

Mr. CANNON. Let me ask right there, if you will allow me, Mr. Chairman; suppose it was the sense of Congress to do the work which you have estimated for to construct mortar batteries and to consolidate the two items—

General CRAIGHILL. Yes, sir.

Mr. CANNON. How much of that work would be paid for during the next fiscal year, and how much of it could you meet by a contract?

General CRAIGHILL. Well, sir, we can not make a contract that will cover the whole United States—

Mr. CANNON. I understand that exactly; but suppose that Congress agrees that \$1,885,000 worth of work ought to be done the coming fiscal year?

General CRAIGHILL. We will expend the whole in the next fiscal year.

Mr. CANNON. Now, will you need the whole of that money actually to pay out of the Treasury during the next fiscal year?

General CRAIGHILL. Yes, sir. If you give it to us we will have it all expended, and this is the result we will obtain. I can expend a good deal more if you will give it to me.

Mr. CANNON. I just wanted to find out exactly on that question.

General CRAIGHILL. Yes, sir.

The CHAIRMAN. What proportion of that money could be expended by application of the continuous contract system?

General CRAIGHILL. The continuous contract system is not applicable, really, to this case. The continuous contract system is this: that we know what we want to do will cost, say, \$1,000,000, and we make a contract for the whole of it with the understanding that Congress guarantees that we are going to have the money as fast as we can economically expend it, and we make contracts for the whole amount, limiting each year the expenditures to the amount that Congress appropriates for those particular years.

Now, in continuation of that statement, if Congress would say to me I can make contracts for \$60,000,000 or \$70,000,000 for fortifications, which is the total estimate for the completion of our system, then I can make at each locality a continuous contract with the understanding Congress will give it to me in five, six, or seven years consecutively, and if Congress limits this without any reference to the contract system to the appropriation say of \$2,000,000 in round numbers, which is distributed as I say over eighteen or twenty different localities, it would not be expended under contracts, that is to make large contracts at any one of them, because the amount would not be sufficient.

The CHAIRMAN. In other words, if I understand you, where the money is appropriated under general law you have authority to make a contract after the money is appropriated to that extent?

General CRAIGHILL. Yes, sir.

The CHAIRMAN. Now, within twelve months you could make a contract to do work to the extent of this \$2,000,000?

General CRAIGHILL. Yes, sir.

The CHAIRMAN. Now, if that is the sense—

Mr. LIVINGSTON. But you have no continuous contract here?

The CHAIRMAN. No; but if it is the sense of Congress to authorize, say, \$4,000,000—

General CRAIGHILL. I can expend that.

The CHAIRMAN. But if it is the sense of Congress to authorize \$2,000,000 more, including the other \$2,000,000 for the next fiscal year, so you could make a contract, would you need the money until the year after next?

General CRAIGHILL. You can do that.

Mr. GROUT. What do you think the economy of such a plan would be as allowing you to do the whole work, to authorize contracts for its completion?

General CRAIGHILL. I have had a pretty large experience for the last twenty, thirty, or forty years with the river and harbor works and my judgment is the continuous contract system as applied to rivers and harbors has resulted in an economy of from 25 to 30 per cent and so it would be for fortifications. Now, I have no doubt of that, and Mr. Sayers knows of the Galveston Harbor and can confirm that in a great measure.

Mr. SAYERS. I do not think there is any question about that.

Mr. CANNON. On that same suggestion, if you will pardon a single suggestion which occurs to me; in the river and harbor work, a continuous contract covers the exact work?

General CRAIGHILL. Yes, sir.

Mr. CANNON. The work that you want to do?

General CRAIGHILL. Yes, sir.

Mr. CANNON. Now, is not this an element in the fortifications? Does the experiment as in a gun carriage instead of a gun lift, and in the different manner of making guns modify the problem somewhat so that what you would gain by having a continuous contract would be compensated in part by enabling you from time to time to change your plans where you proceed by an appropriation from year to year?

General CRAIGHILL. There is something in that.

Mr. GROUT. That would relate only to the guns and carriages, and would not relate to the batteries.

General CRAIGHILL. It relates more particularly to the guns and carriages themselves, and not so much to the work of the Engineer Department.

Mr. GROUT. What about emplacements, whether that principle would apply to them?

General CRAIGHILL. To a certain extent; but contracts are always susceptible of minor amendments. There is seldom a large contract made but by common consent; a supplemental arrangement can not be made for just such things. It comes up in rivers and harbors just as it would in fortifications.

The CHAIRMAN. These changes are less frequent in the engineering division of the work than the ordnance division of the work?

General CRAIGHILL. Minor changes of the sort can be arranged from time to time as the exigency arises, with the understanding, of course, the total amount is not to be exceeded.

SITES FOR FORTIFICATIONS.

The CHAIRMAN. Passing now to the next item for "sites for fortifications and sea-coast defenses," you ask \$250,000?

General CRAIGHILL. The next is the purchase of land for fortifications, the third item.

The CHAIRMAN. I see your estimate there is \$250,000, and that nothing has been appropriated since the fiscal year 1895?

General CRAIGHILL. Yes, sir.

The CHAIRMAN. Please give the committee the considerations showing the necessity for that appropriation.

Mr. LIVINGSTON. You do not want any of this \$250,000 to carry out that detail plan if we do not give you this money over on the other page; it simply looks to future operations?

General CRAIGHILL. Of course we can not build on land which does not belong to us.

Mr. LIVINGSTON. That is not the question. Do you want any of this \$250,000 to buy land to put these guns on until you get this money over here?

Captain BLACK. You understand it takes a long time to get the land?

Mr. LIVINGSTON. I understand that thoroughly; I have been on this committee

long enough to know all about it. I only wanted to ask that question. Do you want the money for this unless you get the money for the other?

General CRAIGHILL. I will say in general terms in reference to this that this is an estimate for the purchase of lands for fortifications as we are obliged to look ahead; as you gentlemen who are lawyers know how long it takes to get possession of a site. Captain Black informs me in making up the estimate that this \$250,000 is for sites to which we are looking in the future, and not to those at present, except in one place—Puget Sound—for which we have estimated \$140,000.

Mr. LIVINGSTON. Now, if we give you \$250,000 where are you going to expend it?

General CRAIGHILL. Of course I will read these points to the committee, but my judgment is it should not be made public. As you gentlemen readily understand, just as soon as it is understood the Government of the United States wants to get a site for anything, the land sharks come in and prices go up, and we try to keep these things as much as possible to ourselves.

(General Creighill read a list of the proposed sites.)

Mr. GROUT. Do you think \$250,000 would cover lands sufficient at those points?

General CRAIGHILL. I have a statement here which I want to speak of later. I am confining myself entirely to this estimate. I can just at this particular moment say that for all the sites we want throughout the United States we would desire \$1,500,000.

Mr. GROUT. I had reference in my question to the list you read here, whether you thought this \$250,000 would secure those sites?

General CRAIGHILL. Yes, sir.

Mr. GROUT. Do you think it would be sufficient to do that?

General CRAIGHILL. Yes. Looking to the future upon the scale on which these estimates were made, \$250,000 is what we wanted, but for all the sites we want in the United States to complete our system of defense we want \$1,500,000 for sites, and I have not included that here in the estimate.

Mr. LIVINGSTON. You mean to say \$250,000 will keep the work going?

General CRAIGHILL. Yes, sir; looking to the future after the expenditure of this \$2,000,000, and getting ready sites for the next appropriation.

PRESERVATION AND REPAIR OF FORTIFICATIONS.

The CHAIRMAN. Now pass to the next item, "For the preservation and repair of fortifications."

General CRAIGHILL. That is a small item for the protection, preservation, and repair of fortifications, existing works, for which there is an estimate of \$70,000. The distribution of that can be read to the committee, but I will say in general terms with reference to it, as the committee knows, we have a number of old works in which garrisons live and guns are mounted of certain qualities, the best we have, and for the preservation and repair of these works and keeping them in decent condition we want for the next fiscal year \$70,000.

Mr. GROUT. Can you designate where these works are located?

General CRAIGHILL. Yes, sir; I can. The following table gives the names of the works and the amount which the officers in charge of them estimate as necessary for their care and preservation during the fiscal year 1897.

Preservation and repair of fortifications.

Works.	Estimate of officers, fiscal year 1897.	Works.	Estimate of officers, fiscal year 1897.
Fort Wayne, Mich.	\$100.00	Fort on Dutch Island, R. I.	\$100.00
Fort Porter, N. Y. ....	.....	Fort Trumbull, Conn. ....	.....
Fort Niagara, N. Y.	500.00	Fort Griswold, Conn. ....	.....
Fort Ontario, N. Y. ....	.....	Fort Halo, Conn. ....	.....
Fort Montgomery, N. Y.	720.00	Fort Schuyler, N. Y. ....	.....
Fort Knox, Me.	200.00	David's Island, N. Y. H. ....	.....
Fort Popham, Me.	300.00	Willet's Point, N. Y. ....	.....
Fort Gorges.	100.00	Defenses on Governors Island, N. Y. H.	365.00
Fort Preble, Me.	250.00	Fort Wood, N. Y. ....	.....
Fort Scammel, Me.	200.00	Fort Hamilton, N. Y. H.	900.00
Battery at Portland Head, Me. ....	.....	Fort Lafayette, N. Y. ....	.....
Fort McClary, Me.	150.00	Defenses on Staten Island.	2,920.00
Fort Constitution, N. H.	150.00	Fort Hancock (Sandy Hook), N. J.	4,400.00
Battery at Gerrish's Island, Me.	50.00	Fort Mifflin, Pa.	4,478.00
Battery at Jerry's Point, N. H.	50.00	Site for defenses at Red Bank, N. J. ....	.....
Fort Warren, Mass. ....	.....	Fort Delaware, Del.	23.00
Battery at Long Island Head, Mass. ....	.....	Battery at Finns Point, N. J.	800.00
Fort Winthrop, Mass. ....	.....	Fort opposite Fort Delaware, Delaware shore.	90.00
Fort Independence, Mass. ....	.....	Fort McHenry, Md.	48,274.00
Grover's Cliff, Mass. (mortar battery).	900.00	Fort Carroll, Md.	3,300.00
Fort at Clarke's Point, Mass.	290.00		
Fort Adams, E. I.	890.00		

Preservation and repair of fortifications—Continued.

Works.	Estimate of officers, fiscal year 1897.	Works.	Estimate of officers, fiscal year 1897.
Fort Foute, Md.....	\$1,870.00	Fort Gaines, Ala.....	\$875.00
Fort Washington, Md.....	7,860.00	Fort on Ship Island, Miss.....	200.00
Sheridan Point, Va.....	625.00	Fort Pike, La.....	
Fort Monroe, Va.....	3,100.00	Fort Macomb, La.....	
Fort Wool, Va.....	600.00	Tower Dupre, La.....	
Fort Macon, N. C.....		Battery Bienvenue, La.....	
Fort Caswell, N. C.....		Tower at Proctorsville, La.....	
Fort Moultrie, S. C.....		Fort Jackson, La.....	500.00
Fort Sumter, S. C.....		Fort St. Phillip, La.....	
Fort Johnson, S. C.....		Fort Livingston, La.....	
Castle Pinckney, S. C.....		Fort at San Diego, Cal.....	770.00
Fort Oglethorpe, Ga.....	750.00	Fort Winfield Scott, Cal.....	2,010.00
Fort Pulaski, Ga.....	350.00	Fort at Lime Point, Cal.....	5,080.00
Fort on Tybee Island, Ga.....		Fort at Alcatraz Island, Cal.....	770.00
Fort Clinch, Fla.....	22,600.00	Fort Mason, Cal.....	625.00
Fort Marion, Fla.....		Angel Island, Cal.....	1,100.00
Fort Taylor, Key West, Fla.....	3,475.00	Yerba Buena Island, Cal., torpedo station.....	1,370.00
Fort Jefferson, Fla.....		Defenses of mouth of Columbia River, Oregon and Washington.....	
Fort Pickens, Fla.....			
Fort Barrancas, Fla.....			
Fort McRee, Fla.....			
Fort Morgan, Ala.....	1,150.00	Total.....	123,582.00

The \$70,000 for preservation and repair of fortifications in the estimates is to meet the most essential of these requirements. These amounts are requested for the purpose of caring for ungarrisoned works and for making the repairs necessary to preserve the works themselves and to keep the platforms of the guns mounted on them in condition for service.

Mr. GROUT. I suppose you do not contemplate making repairs on all of them.

General CRAIGHILL. It is just like a house. You have to do whatever is necessary to keep it going, and this is the estimate for fixing these places, and it is really to save money that we make these little repairs which are just like a man stopping a leak in his roof.

Mr. GROUT. Have you in mind any one of these forts requiring special attention and special work at this time?

General CRAIGHILL. The estimates have been made carefully from special examination in each locality for making up this estimate.

Mr. GROUT. You do not mean to say something is going on at every one of these in the way of repairs.

General CRAIGHILL. Yes, sir; just as if anyone owns a house, he has to keep it in repair.

Mr. CANNON. Let me ask you right there. These repairs are not made in those forts not occupied by persons, and therefore is it necessary to keep them decent for people to live in?

General CRAIGHILL. They are kept decent for the purpose——

Mr. CANNON. They are not any good for defense?

General CRAIGHILL. They are the best we have.

Mr. CANNON. But in a general way I understand they are not of the slightest value on earth.

General CRAIGHILL. That is a mistake.

Mr. GROUT. Can you designate on which the most extensive repairs are to be made, and tell us what the projected repairs are?

General CRAIGHILL. Yes, sir; take Fort Monroe. I take that out as being known to almost everybody.

Mr. GROUT. An important place, too?

General CRAIGHILL. There is a large development there and quite a number of guns mounted there—15-inch guns, and some rifled guns—which are the best we have, and all we ask at Fort Monroe is \$2,000.

Mr. GROUT. What particular work requires to be done at Fort Monroe?

General CRAIGHILL. We want repairs to the parapets. They are injured by the wind which blows the sand on them and we have to keep them planted with grass to a certain extent, and things of that sort; little incidental repairs from time to time.

Mr. GROUT. Is that one of the largest items on your list?

General CRAIGHILL. That is one of the largest; yes, sir.

The CHAIRMAN. It is for making incidental repairs?

General CRAIGHILL. And when you think of \$70,000 for the whole United States it is very small for each particular locality.

The CHAIRMAN. I see of the previous appropriations there is no appropriation as large as \$70,000 except in 1892, when it was \$80,000, and since that time the appropriations have run down to \$60,000 for 1893, and \$45,000 for each succeeding year. Now what would be the effect of cutting down this estimate of \$70,000 to \$45,000?

General CRAIGHILL. The effect would be we would have to leave undone a great many things which ought to be done.

The CHAIRMAN. Would it be an economy, or would greater damage result from the failure to expend this amount?

General CRAIGHILL. Of course we get along with whatever Congress gives us, but at a place like Fort Monroe we not only want the absolute necessities, but we want to look a little decent when anybody goes there, just as you would keep this room. You paint these doors. That door would last forever if it was not painted. And just so it might be said that the painting of that door is not a necessity, but there it is, painted under the direction of Congress, and it is just so at Fort Monroe. There are many little things which perhaps may not be said to be absolutely necessary at this particular moment, but if permitted to go on will require a large expenditure, and the time will come when the expense of making these repairs will be greatly increased.

The CHAIRMAN. The point I am making is this. Since we evidently have not money enough to do all that should be done, or expended, should we cut down this item here, or should we leave this estimate as it is, at the expense of some other item which may perhaps be of more importance, going substantially to the defense of the country?

General CRAIGHILL. I think this sum for the protection, preservation, and repair of fortifications is a very important one, and should not be cut down if it is practical to retain it at its present dimensions, because sometimes, for instance, at Fort Sumter, in Charleston Harbor, I will mention, a year or two ago we had a gale which was terrific and totally unexpected. The work itself was so damaged that one of the guns was thrown down. These things come constantly, and we have not a contingency fund, so to speak, where we can go to look for repairs that need immediate attention, and if we do not have the money the conditions are just as if the roof of a man's house was off and he did not have any way of repairing it. We must have a contingent fund, so to speak.

Mr. GROUT. How much of this \$45,000 has been expended?

Captain BLACK. We have left to carry us to the 30th of June \$2,400. There have been demands which would have exhausted this sum and more, but it is deemed absolutely essential to keep a small sum on hand to meet emergencies. The last call we had was for Fort Trumbull, Conn., which is a garrisoned fort, and where the sea wall had become broken down. If we could give the money it would cost \$300. and if we had to wait until next year it would cost \$1,500.

General CRAIGHILL. That is a very good illustration, and that is a case which passed through the office a few days ago. It is for these little contingencies which it is impossible to anticipate and foresee.

The CHAIRMAN. You think it is as important as any other item in the bill?

General CRAIGHILL. Very decidedly.

PLANS FOR FORTIFICATIONS.

The CHAIRMAN. Pass to the next item. "For preparation of plans and fortifications" you ask \$5,000.

General CRAIGHILL. Of course the most of the studies of plans and fortifications are made by the officers themselves, but we must have draftsmen to help us, and this \$5,000 is for assistance of that kind in preparation of plans for defense.

SEA WALLS.

The CHAIRMAN. Pass to the next item of "sea walls and embankments," for which you estimate \$29,225.

Mr. LIVINGSTON. We have them in the note here.

General CRAIGHILL. I have them all here. There is a sea wall at Sandy Hook, N. J. I can read the whole of them off here: Bedloes Island, Davids Island, Fort Schnyler, New York Harbor, and Fort McHenry, Md. These estimates have been closely worked down to as low as \$225 in one instance.

Mr. LIVINGSTON. What did we give you last year for that?

The CHAIRMAN. Nothing.

Mr. CANNON. Is this a necessary appropriation?

General CRAIGHILL. I think so.

The CHAIRMAN. Explain, if you please, the necessity for this appropriation, in general terms.

General CRAIGHILL. Perhaps I should take up Fort McHenry, which is one with which I am familiar. It is situated in Baltimore Harbor and it is occupied by a gar-

rison, and it has a cemetery attached to it, and about two years ago, for want of a sea wall, the waves and currents down there eroded the site so that the bodies of officers and men who had been buried there years ago were thrown out by a gale. It is for the purpose of that sort, for that particular thing at Fort McHenry, we want a sea wall, to prevent the continual throwing out of the bodies of officers and men who died in the service and had been buried there; and a part of this estimate is for Fort McHenry.

Mr. GROUT. How much of a figure in the defense of Baltimore would Fort McHenry cut in case of an attack?

General CRAIGHILL. Well, Fort McHenry is not so important as it once was, but it was the salvation of the city in 1812, and the usefulness of Fort McHenry at this time, if I may be permitted to say so, is this: That the outer line of defense is some distance below Fort McHenry, but there is always danger of small vessels in the smoke and confusion of action passing through the outer line, and one or two of them coming up near a great city, would do a great deal of damage, and this is the reason why we maintain these interior lines; and there is where the inferior old-fashioned guns come in to a certain extent, because against the small, lightly built vessels these old guns are just as good as they ever were.

Mr. GROUT. The projected works are somewhat farther down the bay?

General CRAIGHILL. Oh, yes, sir; much further down, and I am very glad you have given me an opportunity to make this explanation, because it is one that has weight at every fort we have. The same applies to New York, to some of the old interior works which they say have no use; but it is not so, as they are of use to that city.

Mr. GROUT. The guns used there are of old fashion?

General CRAIGHILL. But very useful guns against these minor craft that might slip by; and if you will permit me for a moment, I will give you an illustration of what actually took place in 1812 at Fort McHenry. Admiral Cockburn came up with a fleet and attacked Fort McHenry, and at the same time a land force landed at North Point, to come up on that side of the city. Admiral Cockburn sent about 1,200 men in small boats, passing around Fort McHenry under cover of the smoke and confusion of battle, and the expectation of these small boats was that they would land behind the fort and make an assault while he was attacking in front; but by good fortune there was a little battery of field guns in one of the parks of Baltimore which fired into these boats and so disorganized them and demoralized them that, instead of landing, they retreated; and when that failed Admiral Cockburn's plan failed, and he withdrew his fleet, and when he withdrew the troops withdrew, so it is a very strong illustration of what I say as to the importance of maintaining these interior lines to cut off just such a small flotilla which would slip by the main line in the noise, smoke, and confusion of battle.

Mr. GROUT. Have you the amount that you would expend at Fort McHenry?

General CRAIGHILL. I have not it here but I can furnish it to you. You understand this \$29,000 is for the whole United States.

Mr. GROUT. But it is estimated for in detail?

General CRAIGHILL. Yes, sir; I can furnish it if you would like to have it.

Mr. GROUT. You had better do that.

The CHAIRMAN. You will make that a part of the record.

General CRAIGHILL. I can send to you all of these details.

The CHAIRMAN. And also in that connection will you please indicate the relative importance of the items?

General CRAIGHILL. Yes, sir.

The CHAIRMAN. So that if it seems proper to make any discrimination it can be done.

TORPEDOES.

The CHAIRMAN. The next item is "For torpedoes for harbor defense," on page 3.

General CRAIGHILL. Yes, sir; and, as I have said before, the torpedoes are a very important part of our defense, and the total estimate for torpedoes throughout the whole United States, as I said before, was \$2,500,000.

Mr. CANNON. That is under the Endicott scheme?

General CRAIGHILL. Yes, sir; and under the revised Endicott scheme, so that the sum we have asked here is almost infinitesimal.

Mr. CANNON. But it is in harmony with the other estimate?

General CRAIGHILL. Yes, sir; it is certainly not to be diminished, and it would be a very economical thing if it could be increased to \$2,000,000. I say that with perfect sincerity, because torpedoes are things we have to depend upon very much.

Mr. CANNON. You would not increase that to \$2,000,000 unless the other appropriation was increased?

Mr. GROUT. You could not use your torpedoes until you had your guns ready, I suppose, to cover them?

General CRAIGHILL. That brings up the point I mentioned before—that for the covering of these torpedoes we can use our old guns.

Mr. GROUT. But if a heavy war vessel comes to attack the channel and goes along and deliberately picks up the torpedoes, there must be something to interfere with that?

General CRAIGHILL. There is this about it: It is not the big ship which would engage itself in picking up the torpedoes, but they would send forward small vessels, like the skirmishers of an army, who would go to the front, and they are vulnerable to the old-fashioned guns.

Mr. GROUT. Clearing a way for the vessels behind?

General CRAIGHILL. Yes, sir.

The CHAIRMAN. I understand this estimate of \$50,000 corresponds with the general tenor of your other estimates, and should be increased or decreased *pari passu* with the others.

General CRAIGHILL. Well, it is a very important thing.

Mr. CANNON. I wish you would answer this sometime, or perhaps I had better ask it now: In the case of war torpedoes are readily accumulated, I understand?

General CRAIGHILL. No, sir; not at all. A torpedo is quite a complex thing. What goes in the water to explode is one thing, but then it has to be connected with a torpedo casemate, which we will come to presently, and then it needs all the electric appliances to guarantee certainty of operation, and embraces everything of that sort; and it is a complex affair, and it takes time to prepare a certain part which ought to be prepared in advance.

Mr. GROUT. Is it likely to deteriorate when it is once placed?

General CRAIGHILL. Some parts of it, yes; but there are some which are quite permanent.

Mr. GROUT. What portion of it would deteriorate and would pass away from lapse of time and nonuse.

General CRAIGHILL. The cable is something.

Mr. GROUT. How expensive is that part of the torpedo?

General CRAIGHILL. Captain Black is an expert on torpedoes, as he has just come from Willets Point—

Captain BLACK. That is quite a part of the system, but it would not be necessary, however, to buy so very much of it, for the reason cables have come into use so much in these electric ways and subways of the country.

Mr. GROUT. Is that something that can be got to order at any time in any quantity?

Captain BLACK. It can be obtained to a moderate extent.

General CRAIGHILL. We would not wish to keep it in store, because it deteriorates; so the purchase of cable is a thing we would defer.

Mr. GROUT. The torpedo itself would not deteriorate when it is once placed and charged if kept in suitable repair?

General CRAIGHILL. No, sir.

Mr. GROUT. And it would be ready after five years, and be just as good as it is now?

General CRAIGHILL. Yes, sir.

Mr. CANNON. One other question, if you will pardon me, in regard to the \$50,000 for torpedoes. Suppose you owned all these harbors and were only going to get the amount of your estimates here for guns, etc. Now come to the items of torpedoes. In the event of sudden trouble or trouble in the next two years or three years, could you increase or decrease this item for torpedoes?

General CRAIGHILL. Well, we would increase it very materially.

Mr. CANNON. Without reference to whether you had an increase for guns or not?

General CRAIGHILL. Yes, sir; we would depend very much upon torpedoes.

Mr. CANNON. They are comparatively cheap as compared with everything else of a defensive nature?

General CRAIGHILL. I know they are, and that is one reason why we ought to get them. You know the estimate is \$2,500,000 for the whole United States.

Mr. CANNON. But you would not want \$2,500,000. Suppose you were doing this thing yourself and were going along at the gait of your estimates here, and take the conditions without guns and everything else, how much would you set aside for torpedoes to get ready?

General CRAIGHILL. In a sudden emergency?

Mr. CANNON. From the standpoint of defense?

Mr. GROUT. Having the rest of the items fixed as they are in the bill, aggregating as they do in this bill?

Mr. CANNON. Have you got this too small or too large?

Captain BLACK. We judged in making out these estimates the amount that we would be likely to get and cut the estimate down accordingly to the minimum amount. This \$50,000 is right in proportion with the other.

The CHAIRMAN. Bear in mind torpedoes deteriorate, as he suggested?

Captain BLACK. The torpedo will not deteriorate. When planted it can not be

examined readily. So the torpedo must be arranged in such a manner that it will show its condition as to soundness at all times, as well as announce when it is struck. Should a leak in the torpedo or its cable occur, it must be possible to determine its location. All of this requires electrical apparatus of a peculiar pattern, which is a secret thing and must not be known outside. There is only one firm in the United States which is prepared now to furnish torpedo cases—

Mr. GROUT. Are they manufactured in the United States?

Captain BLACK. Yes, sir. The torpedo case—the operating box, as it is called—and the apparatus within the torpedo case which makes it sensitive or not at will, together with certain minor parts, will not deteriorate. They can be bought from time to time, as funds are available, and stored at places where they are to be used. A certain amount of cable should be bought and kept on hand. As cable becomes more and more an article of general commerce it will be possible to rely on the stock in the market to meet emergencies.

The CHAIRMAN. What time would be required in the case of an emergency to secure the torpedo service to protect our harbors?

General CRAIGHILL. At least a year, sir.

Mr. GROUT. There is no torpedo system in the river here?

General CRAIGHILL. The torpedoes are here.

Mr. GROUT. But there are no casemates.

General CRAIGHILL. Yes, sir; there is one.

Mr. GROUT. I was going to suppose, in case none were here, how soon could you put them in the channel of the river below the forts, in shape so as to have them under cover of the forts and protect the river?

General CRAIGHILL. I think we estimated about thirty days.

Captain BLACK. I understand now we can put them in inside of two weeks.

The CHAIRMAN. Have you a stock on hand?

Captain BLACK. Yes, sir; we have got about \$600,000 worth of material.

Mr. GROUT. Where situated?

Captain BLACK. At about eight ports, sir.

Mr. GROUT. What sort of an arrangement?

Captain BLACK. They are stored in the old fortifications, in the casemates of the old fortifications, as a general rule. In one or two places we have storehouses specially made for them.

Mr. GROUT. In dry places?

Captain BLACK. Yes, sir.

The CHAIRMAN. Passing to the next item, "For useful casemates, cable galleries, etc," you ask \$50,000.

General CRAIGHILL. That is a part of the torpedo defense. In regard to those casemates, of which mention was just made, there has to be at every place where a torpedo system is operated, a bombproof casemate for the operator who controls the explosion of the torpedoes and the electrical apparatus to manage them, and that item of \$50,000 is for the construction of these casemates.

Mr. GROUT. Is he where he sees an approaching vessel and ascertains its exact location?

General CRAIGHILL. He can not always see with his own eyes, but he has communication with those who do see.

Mr. GROUT. So as to know when a vessel reaches a particular point?

General CRAIGHILL. Yes; he has his map made up with all the torpedoes and where situated in the line of channel, and everything of the sort, and when he is notified a vessel is just on the point of crossing—

Mr. GROUT. Then up she goes?

General CRAIGHILL. Yes, sir.

Mr. GROUT. If there is no smoke in the way of the bombproof he can see it under ordinary circumstances?

General CRAIGHILL. As a rule he could not see.

Mr. GROUT. He relies upon information from the outside?

General CRAIGHILL. He has to depend upon other people's eyes.

Mr. GROUT. By signal or telegraphic information?

General CRAIGHILL. Sometimes one and sometimes the other. He is like the chief engineer of a big battle ship, he does not know where she is, but goes back and goes forward at the ring of one bell or two bells, and all that sort of thing.

Mr. GROUT. Have you anything to say about armaments?

General CRAIGHILL. No, sir.

The CHAIRMAN. This closes, as I understand, the items in which the General is directly interested.

General CRAIGHILL. Yes, sir; those estimates were made out in the usual routine way before the flurry came on, if I may use such an expression, that caused the Coast Defense Committee of the Senate to take so much interest in the matter.

Mr. SAYERS. Do you regard this estimate as made upon the minimum basis?

General CRAIGHILL. Yes, sir; and in making up our estimates I must say we took for granted that Congress in the past has been doing the best it could for us, and our estimates are put upon that basis to some extent, and at the same time our individual judgment is we ought to have a great deal more money than this estimate.

Mr. GROUT. How many guns are there on the skids under the Ordnance Department?

General CRAIGHILL. That I can not say.

Mr. GROUT. How many guns have you to-day?

General CRAIGHILL. I can not tell you. I have those things in my office, but I have not got them in my head. I will make this general statement just on the line of Mr. Cannon's question a little while ago, that the Chief of Ordnance and the Chief of Engineers make their estimates to Congress to run together; that is to say, that the operations at the end of certain time will produce a certain result in platforms, and everything of that sort, for the Engineers to be ready and for the Ordnance to be ready with their guns and carriages. As a rule Congress does not give us the money we ask for. Then, when we find how much money has been given us, we come together again and find how much we can do, and work together in that way so that if Congress should see fit to give us more than \$2,000,000 for fortifications I would immediately apportion it among the different parts of the United States; I would find out what platforms, etc., would be in readiness for the Chief of Ordnance at the end of the fiscal year. We would notify him at once, and if he did not have the guns and carriages ready, then he would go to work immediately and get them ready as soon as he could.

THURSDAY, March 5, 1896.

STATEMENT OF GEN. WILLIAM P. CRAIGHILL, CHIEF OF ENGINEERS—Continued.

CONTRACT SYSTEM—GUN AND MORTAR BATTERIES.

The CHAIRMAN. General, the committee will be pleased to have you give us information as to whether or not a contract provision would be useful or desirable to be made in any of these items of appropriations under the estimates made for your Department, and also what amount of the proposed estimate could with profit be expended between July 1, 1896, and March 4, 1897?

General CRAIGHILL. I will say, Mr. Chairman, in answer to the first point with reference to the application of the contract system, I suppose you are referring to the estimate of \$2,000,000, in round numbers—the \$1,815,000, and the \$70,000 added to it?

The CHAIRMAN. Yes, sir.

General CRAIGHILL. I will say that it is our rule always to make contracts as far as possible. That is the general rule, and that, as a rule, cheapens the work, although in some very isolated localities—

Mr. CANNON. I do not think you understand the chairman's question. You make contracts wherever you can, but I think he had in his mind the question of the actual payment of money between the 1st of July next and the 4th of March next. How much of it must be paid, and what proportion of it would be covered by contract if you had authority to contract where the money would have to be paid after the 4th of March next?

The CHAIRMAN. And having also reference to each of the items for which we have estimates to cover in this bill.

General CRAIGHILL. I was coming to that.

Mr. CANNON. I beg your pardon. Go ahead.

General CRAIGHILL. I was explaining our rule was, as a general thing, no matter what amount we have, to contract for materials as far as possible, but there are some localities which are so isolated that sometimes we can not get a contract, and then we must do the work the best we can; and that rule would prevail in reference to any amount Congress would give us. If Congress would give us at any time money enough to make what we call a continuous contract—I suppose that is the idea you have in mind—

The CHAIRMAN. Not necessarily continuous, but the amount covered by this appropriation.

Mr. CANNON. You were confirmed in the Senate committee examination—in other words, that was a continuous contract investigation? Suppose it was the sense of this committee to recommend substantially the appropriations estimated for under the engineers for the coming fiscal year, how much of those estimates would actually

be paid out to enable you to prosecute the work between the 1st of July and the 4th of March next, and how much of that work, if you were authorized, could you place under contract without the money being appropriated, keeping within the authorization where the money would be paid after the 4th of March, 1897. In other words, he wants to see how much money must be appropriated to do this work where it is necessary to pay the money out by the 4th of March, 1897, and how much you could be authorized to contract for, and let the next session of Congress appropriate the money, and let the contracts fall in after March 4, 1897?

The CHAIRMAN. Here, now, is a specific illustration: For gun and mortar batteries you estimate \$1,815,000?

General CRAIGHILL. Yes.

The CHAIRMAN. Now, that item is made to cover the operations under that head for the next fiscal year?

General CRAIGHILL. For about twenty places.

The CHAIRMAN. Now, I desire to know whether or not any part of this work of the construction of gun and mortar batteries could with profit be placed under contract, and if so, what proportion of the amount estimated would necessarily be paid out on the contract before March 4, 1897?

General CRAIGHILL. I understand. Well, the most of this money is for Southern work—I hope you will excuse me for explaining the reasons for the conclusion to which I am coming—but the most of this money is for the southern Atlantic and Gulf Coast, and in the South we can prosecute our work during the winter as well as during the summer, whereas at the North we can not do anything of any great extent in the winter time on account of the bad weather, so if Congress gave me this money I would be able to spend the whole of it by next March and make contracts to carry out all the work it would cover, and more still if you gave me more.

Mr. CANNON. That is, you mean it would be all actually paid out of the Treasury?

General CRAIGHILL. Actually paid out by the 4th of March.

The CHAIRMAN. But in that event you will have nothing absolutely for the residue of the fiscal year?

General CRAIGHILL. Yes, because I want a great deal more money than I have asked for, and if you will give this money I am going to expend it on fortifications as soon as possible, so it is for Congress to decide when they want this money spent, or any portion of it.

The CHAIRMAN. But your estimates are for the year.

General CRAIGHILL. That is a form through which we go; at the same time the fortifications appropriations are never made for fiscal years.

The CHAIRMAN. Now, then, at the rate of speed contemplated here you expect to complete the work by the last of June, 1897?

General CRAIGHILL. We expect to spend this money, but we do not say we will complete this work. We are going to mount a certain number of guns, but we are not going to finish the fortifications of any place at that time.

The CHAIRMAN. Now, may I ask, can you, with profit to the Government and public service, place this first item of gun and mortar batteries under contract?

General CRAIGHILL. We can; yes, undoubtedly.

The CHAIRMAN. Now, then, do you contemplate a greater or less speed in accomplishing this work after March 4, between that and, say, the 1st of July, 1897, than you do prior to that time, or do you expect to proceed continuously?

General CRAIGHILL. I expect to get to work just as soon as the money is available, and drive it with all the expedition I am capable of from the very beginning.

Mr. HEMENWAY. Your judgment is you will have the work completed sufficient to take up the whole sum by March 4?

General CRAIGHILL. I can if Congress authorizes it.

Mr. HEMENWAY. You would do it if this appropriation were made?

General CRAIGHILL. Yes; if that is the understanding we were to have another appropriation on the 4th of March. Of course I am going to conform to the will of Congress in the matter, but I want it distinctly understood I can not only expend this money before the 4th of March, but three times that much if Congress gives it to me, and profitably; and it will be advantageous to the Government, in order that I may look forward to make larger contracts, because, as I have stated on more than one occasion, we can make the contracts more economically the larger the sum is at any particular locality, and if you will look over the items at each locality the sums are comparatively small at each one. Dividing up this \$2,000,000 into twenty places makes the sum at each one comparatively small.

The CHAIRMAN. The bill which is under consideration is based on estimates furnished in part by your Bureau. Let me ask if there are any additional or revised estimates in contemplation by the Department touching the engineering branch of the work?

General CRAIGHILL. Since I was here last I have been looking over the subject very carefully, and I had intended to-day to say to the subcommittee that in this

estimate for sea walls that I should be able to cut that down, and perhaps address a communication to you or to the chairman of the full committee, making a reduced estimate in that direction.

The CHAIRMAN. I suggest it should be directed to the chairman of the full committee.

General CRAIGHILL. The total amount is about \$29,000, and I think I can bring that down to \$20,000. My disposition is to economize in every possible direction.

The CHAIRMAN. You wish, I believe, to say something in respect to the preservation, repair, and care of fortifications?

General CRAIGHILL. It is only to press what I stated the other day as to the great importance of giving that \$70,000 for the purpose of keeping in repair the old works.

The CHAIRMAN. Now, let me inquire as to what is included in the term "preservation and repair of fortifications," and especially whether or not any part of that is intended as pay for watchmen where the forts are not garrisoned, and what proportion of those forts are ungarrisoned?

General CRAIGHILL. The ungarrisoned forts, if you will permit me to say, are all left in charge of the Engineer Department, and many of them are such that they are not to be occupied by a garrison except in times of war; and besides the guns, carriages, the torpedoes, and things of that sort, there is always a good deal of moveable property which is liable to be stolen, and it is necessary to have there what we call "fort keepers" at many of these places—men who are paid very small sums, \$30, \$40, or \$50 per month. But we must have them, and a part of this item is for payment of men of that sort to take care of Government property, and it is included in the term "preservation of Government property" at these places; and there must be a hundred places all along the coast from Maine to the Columbia River.

The CHAIRMAN. What proportion of these forts are ungarrisoned?

General CRAIGHILL. About three-fourths.

The CHAIRMAN. So, then, a considerable part of this estimate is for pay of watchmen?

General CRAIGHILL. Not a considerable part, no; but I should suppose one-third; and I should say in addition, the estimates from the local officers for these particular places amount to about \$125,000, and going over it very carefully and scrutinizing every item we have reduced it to \$70,000, and that I do hope will be permitted to go through by the committee. It is a very small sum, but it is a very important sum.

The CHAIRMAN. You feel that should not be reduced?

General CRAIGHILL. I think not; no, sir. That is, if the committee should think it necessary or expedient to cut down this \$2,000,000, I hope they will at least let me have the \$70,000 without reduction; and, as I have said before, I will submit a communication reducing the estimates from \$29,000 for repair of sea walls, etc., to probably about \$20,000. Of course it is a small reduction, but a very large proportionate reduction.

The CHAIRMAN. Now, the expressions you have made respecting gun and mortar batteries and putting them under contract apply with equal force to the estimates for torpedoes for harbor defense and needful casemates and cable galleries and like items?

General CRAIGHILL. Those sums ought not to be reduced.

The CHAIRMAN. But I say the same observations apply to them, that they could be advantageously placed under contract?

General CRAIGHILL. Well, we can construct casemates under contracts, and certain parts of the torpedoes perhaps we can procure by contract.

The CHAIRMAN. But all those you propose to procure by purchase you can, certainly?

General CRAIGHILL. I suppose so.

The CHAIRMAN. I see here an item for appropriation for purchase of submarine mines and necessary appliances to operate them; of course you expect to get them by purchase?

General CRAIGHILL. Some of these electrical things ought not to be subject to contract, because they go into great details, and things of that sort are almost impossible to let out by contract. It is like getting a mathematical instrument, a surveying instrument; you can not make a contract for a theodolite or anything of that sort because they have a fixed price in the market, and I should think it would be inexpedient to say we should purchase our torpedo materials by contract. Captain Black suggests one thing, that the most of these things are kept perfectly secret to ourselves, and we would not want to make public specifications for material of that sort, which are a part of our secret system of defense.

The CHAIRMAN. Then you say that the items for torpedoes and needful casemates, etc., are not properly a subject of contract?

General CRAIGHILL. I do, decidedly.

The CHAIRMAN. And then the contract principle can only apply to the first item which is included in your estimate, namely, gun and mortar batteries?

General CRAIGHILL. You recollect you are going to lump the two items of \$1,815,000 and the \$70,000, and the contract system may be made applicable to them.

The CHAIRMAN. Do you wish to speak of any other item in the estimate?

General CRAIGHILL. No, sir; at the same time I will say this: I think it should be left to the discretion of the Secretary of War whether to have a contract or not in certain localities—like Puget Sound, for example—where it is almost impossible to get a contractor to go there at a moderate expense. A contract requires quite a plant if I may use that expression, and no contractor is going to create a plant and transport everything of that kind to a place at the north part of Puget Sound except at a great expense. Under certain conditions it is better for the Government to do these things itself. It is the rule in the river and harbor appropriations, and I think it a proper rule in the appropriations for fortifications, that the contract system should not be made absolutely imperative, but a certain discretion should be left to the Secretary of War, and under him the Chief of Engineers, as to dispensing with the contract system in any case which he thinks is expedient. That is the general system under which the operations of the War Department are being conducted, and I think it is a judicious and proper one.

The CHAIRMAN. Is there any other matter which you desire to submit for the information of the committee with respect to any of these items?

General CRAIGHILL. No, sir.

The CHAIRMAN. We will be pleased to hear from you if you have any other suggestions to make.

General CRAIGHILL. I have nothing more that I know of; and I will at once write that letter of which I spoke.

SEA WALLS.

OFFICE OF THE CHIEF OF ENGINEERS, UNITED STATES ARMY,
Washington, D. C., March 7, 1896.

SIR: In compliance with your request, I have the honor to submit a revision of the estimate for sea walls and embankments.

A reconstruction of the sea wall at Fort Schuyler, New York Harbor, is necessary, and the portion of the estimate submitted therefor should stand. As the sea wall at Bedloe Island would be useful only as a protection to the base of the pedestal on which stands the Statue of Liberty, and is not essential to the protection of a fortification, I would recommend that that work be dropped.

The wall at Fort McHenry, Md., is absolutely necessary to protect the site of that fort, and should be provided for. The estimates for these two sites are, Fort Schuyler, \$4,225; Fort McHenry, \$13,750; total, \$17,975. This reduces the amount of the estimate heretofore submitted from \$29,225, to \$17,975, which latter sum I strongly urge be appropriated for sea walls and embankments.

I wish also to urgently reiterate the recommendation made to you personally at our meeting, that the full amount of the estimate of \$70,000 be appropriated for the preservation and repair of fortifications.

Very respectfully, your obedient servant,

W. P. CRAIGHILL,
Brig. Gen., Chief of Engineers.

Hon. EUGENE J. HAINER,
*Chairman Subcommittee on Fortifications, Committee on Appropriations,
House of Representatives, Washington, D. C.*

TUESDAY, MARCH 3, 1896.

Gen. D. W. Flagler, Chief of Ordnance, accompanied by Capt. Charles S. Smith of the Ordnance Bureau, appeared before the committee.

STATEMENT OF GEN. D. W. FLAGLER, CHIEF OF ORDNANCE.

The CHAIRMAN. General Flagler is present, and we will take up the portion of the bill which relates especially to the Ordnance Department, so we will be pleased to hear from General Flagler. I thought, in view of what has been done heretofore, gentlemen appearing before us should make statements in a connected sort of way, covering their several departments embraced in the bill, and after having made their full general statement, opportunity would be afforded for asking such questions as occur to members of the committee.

General FLAGLER. I think, gentlemen, I had better tell you first how my estimate is made. I suppose that members of the committee are aware that about eleven years ago there was a board composed of members of the House, Senators, officers of the Army and of the Navy, which is now called the Endicott Board. Mr. Endicott was Secretary of War at the time, and was chairman of the board. That board finally arrived at a system of defense for our whole coast except Puget Sound. The report decided what the defense of each of the principal ports of the United States should be, there being twenty-seven of them, and subsequently two other

reports embraced the defenses of Puget Sound. This is the armament for the United States coast upon which we are engaged. It has been adopted by Congress.

The amount of defense which was provided for or contemplated in the report of that board is what we are providing. Congress commenced in 1888 to make appropriations for these defenses. One of the most important appropriations or provisions made by Congress in providing for this defense was the establishment of the Army Gun Factory at the Watervliet Arsenal, Troy, N. Y., for the manufacture of large seacoast guns. That is where we are making all our guns, except 100 guns for which a contract was made in 1891 with the Bethlehem Company under a special act of Congress, and that company is manufacturing 100 guns under that contract. The rest of the guns are being made at the Government gun factory at Troy, N. Y. The action taken by Congress at various times would indicate that in the estimation of Congress the capacity of that factory was not sufficient to go on with the production of this armament as fast as Congress desires, and it has been stated that the reason for making this contract, which was not a favorable contract for the United States, was to enable us to get on faster.

Mr. SAYERS. Let me interrupt you. That is not the only reason; the main reason that led to that provision was to give private establishments an opportunity to make guns.

Mr. CANNON. To establish a plant.

Mr. SAYERS. Yes, sir; to establish a plant and make guns. It was at the time I think I had charge of this bill, and that clause was put on in the Senate and in the conference between the two Houses, I am quite certain the main idea was to give private plants of the country an opportunity to use some of this money which was being expended. That is about the long and short of it.

General FLAGLER. The action of Congress at different times, I think, warrants the War Department in assuming that it is the wish and the intention of Congress to go on with this armament faster than the capacity of the gun factory would permit. It is a fact, however, that for several years, in consequence, probably, of the financial condition of the country, Congress has not deemed it wise to make sufficient appropriation to keep that factory employed to its full capacity. I think the action of Congress at various times, to which I have referred, and a consideration of the troubles apprehended in our country at the present time, authorize us to assume that we should go on with this armament at least as fast as the capacity of the factory will permit. At any rate, that is the plan upon which my estimates are made. I make the estimate first for finishing and assembling at the factory as many guns as the capacity of the factory will permit, or nearly that. This is the first item of this estimate. The next is a most important estimate for sufficient forgings, which we buy to keep the gun factory fully employed. That is the second item, and so on throughout the whole estimate.

The next items are for seacoast gun carriages and projectiles for the guns. The estimate is made to provide for finishing and assembling guns to the capacity of the gun factory, then for procuring by purchase and manufacture a complement of carriages required for the guns and also the complement of projectiles required.

The next, and one of the most important items in the estimate, is that for seacoast mortars and mortar carriages. These mortars are somewhat in excess of the capacity of the gun factory. If an appropriation for the amount of the estimates for seacoast guns is made we would be able to make only a portion of the mortars at the gun factory and would procure the others by contract. For many reasons these mortars constitute one of the most important items in the estimate.

As I am making a general statement I think it best to touch here on something else. There is also in this estimate an estimate for field and siege artillery—that is the guns, carriages, and ammunition for the land service. Perhaps it would be best first that I should state why the provision of field and siege artillery is of such importance. All military gentlemen here will know that the field and siege artillery of to-day is as different from that which we used during our war almost as the firearms are different from bows and arrows. I only say this because I want you to fully understand it would be simply impossible in the event of war to use any field or siege artillery which was in use during our civil war. It would be useless if we compete with any nation of which I can think. Our old material would be of no use whatever. We ought then to be provided with field and siege artillery rapidly.

I will mention one other point as to why I think it is of importance. Until these 27 forts are made impregnable, it is a fact that foreign nations might, in a few weeks, land armies on our coast. We ought, of all nations, to be ready to resist an army on land, and to do this we must have this field and siege artillery. We have done very little in this direction yet, except to complete types, make the necessary investigations, trials, tests, experiments, etc., to perfect the guns, carriages, implements, equipments, ammunition, and all the material required; so that the material we would provide now would be equal to or better in most respects than any other nation. There is no nation, we think, would have a more efficient field and siege

artillery than our plans now call for. For several years there has been an appropriation of about \$25,000 for field guns. That provides about 25. Once or twice there has been some small appropriation for siege artillery, and that is all. We ought to have more, and it is very important that some considerable provision for supplying this want should be made at once. If we were called upon suddenly in the event of war to arm and equip such large armies of volunteers and the National Guard as might be anticipated in case of war, we would require not less than 1,500 field guns, and not less than 150 each of siege guns, howitzers, and mortars. And this would be a small estimate.

The action of Congress for several years past has led to the postponement of this very important armament. It has been deemed necessary to make the appropriations for coast defense very much less than the estimates; and the apparent necessity for devoting all the appropriations that could be granted to the armament of the fortifications has led, practically, to a postponement of this work. In consequence of this I have made the estimates very small—not much more than was required for the Army and for some supplies for the National Guard and the colleges. It has been impossible to provide any reserve for the equipment of armies for taking the field. You will observe that there is very little in the estimates for this important purpose—only sufficient for providing about 25 field guns and the complement of carriages, a small estimate for ammunition for the Army, and a small item of carriages for the seacoast guns.

I make this statement, thinking the committee may desire to consider the necessity for increasing the amounts for these purposes estimated for, as shown in the bill now before the committee. If this were done, it would be necessary that a new estimate were made, submitted to the Secretary of War, and, if approved by him, sent to Congress. The details of the estimate will be gone into later, when we reach them.

The CHAIRMAN. Now, let me ask if the bill which has been prepared for the use of the subcommittee has been based upon the estimates which have been received from the Department?

General FLAGLER. Yes.

The CHAIRMAN. Has the Department in contemplation the submission of any new or modified estimates growing out of the changed conditions of things since the estimates were prepared, or for any other reason?

General FLAGLER. In my consideration of the matter I have thought it best to make the statements I have made to the committee to ascertain their wishes. If, in consequence of any statement I have made, or in consequence of the apprehension, we will say, of trouble and necessities that may be upon us, if the committee should desire to have any of the estimates increased and say so, I would prepare them.

The CHAIRMAN. No. My question was this: Does the Department as at present advised deem it wise to ask to submit an additional or modified estimate?

General FLAGLER. If you are asking me what is my individual opinion of the dangers of the country, I am not willing to have you act upon my judgment in that matter, as I think Congress is a better judge than I am; but I tell you all that is necessary in regard to the technical matters, and that I think we ought to have more field and siege artillery; and we would have to have it in some way if we were to have any trouble, and I would simply state to you the necessities of the case, and if you desire then to have additional estimates, I am confident the Secretary of War would approve and forward them.

Mr. CANNON. But you mean to say, as I understand you, your field and siege guns are of more importance than anything now, without abating your estimates on the other; that is, as between the two, the field and siege guns are the more important?

General FLAGLER. They are certainly not less important than the seacoast guns. I am trying to get the committee to see why, when the reduction was made, the reduction was made on field and siege material for the last four or five years. It has been generally considered that this was a construction which could be hastened in time of necessity, but the seacoast guns could not be so hastened, and therefore the siege and field guns should only be given a small appropriation, or none at all, and that all the appropriations, or nearly all, should be devoted to the seacoast guns. I want to say it is not wise, and I feel now, with the constant apprehension we may get into trouble with someone, we ought to be doing something in regard to this field and siege artillery.

Mr. GROUT. You have been asked in reference to the general estimates, whether you had other estimates to submit, etc. Now, let me ask you the question, and that is, whether these estimates which have been already submitted are more in the light of what this committee and Congress have heretofore done in this matter than what you conceive, individually, the necessities of the public service require?

General FLAGLER. Yes. But this is especially true in regard to the field and siege artillery.

Mr. GROUT. Do these estimates cover all that can be done by your gun plant or

factory and all your carriage factory can do? I understand the carriage factory is located at Watertown?

General FLAGLER. It covers very much more than we can do at the carriage factory. I think Mr. Grout will remember that my plans in regard to that carriage factory were to do only a small portion of the carriage work there. All experimental work is now done at the factory—preparation of, and working up types. All the work to determine the cost, work, fair prices at which work should be contracted, quality of material that is necessary, excellence of workmanship that should be exacted, etc., are determined by our manufactures at the carriage factory. Then we are prepared to contract with parties who can do it, and my estimates for next year are that one-third of the carriages could be manufactured at Watertown, and the other two-thirds could be contracted for.

Mr. GROUT. Now in your estimates here do you calculate for all siege guns to be turned out at the Watervliet Arsenal?

General FLAGLER. All that are in this bill would be turned out there.

Mr. GROUT. And all the field guns?

General FLAGLER. Of field guns we could turn out more there than in these estimates.

Mr. GROUT. Now let me ask you another question. What about these contracts with the Bethlehem Iron Works under the act of 1890; what progress is being made in the production of those guns?

General FLAGLER. If you will read what the bill says—

Mr. GROUT. It says there is a contract, but I am asking you to state the forwardness of the work on those guns, and when they are expected to be completed and ready. It specifies here, twenty-five 12-inch guns, fifty 10-inch guns, and twenty-five 8-inch guns, and I ask when will they be completed?

General FLAGLER. Up to the present time they have been much behind the requirements of the contract, but now they want to deliver much faster than the contract provides for.

Mr. GROUT. What do you mean? These guns?

General FLAGLER. Yes, sir.

Mr. GROUT. How many have been delivered, actually?

General FLAGLER. Ten 8-inch guns are practically delivered and accepted, and they are commencing to deliver five of the 10-inch.

Mr. GROUT. That is, they are testing them, or are you testing them?

General FLAGLER. There is a difference between the words "test" and "proved," and I should have said "proved." We are just commencing to prove the five 10-inch, and the ten 8-inch guns have been proved, and I am having them shipped to the seacoast. I ordered the shipment yesterday.

Mr. GROUT. When will they be ready to deliver this entire amount of 25, 50, and 25, making 100 guns in all, and state, in that connection, when, by the contract, they are to be completed?

General FLAGLER. The contract requires completion of the deliveries in 1903. I should think from their statement now, that they would like to deliver them all in one-half of that time. I rather think that the reason they desire to press work on this contract and make deliveries faster than the contract requires is, that the appropriations for forgings have been low for several years, and they have not had work enough in the establishment to keep their facilities employed, and would like to devote their whole capacity to the production of these guns.

I rather think if the estimates for forgings contained in this bill are filled it would result in giving the Bethlehem Company such large contracts for forgings that they would not then care, and perhaps might not be able to deliver the guns faster than is provided for in the law and in the contract.

Mr. GROUT. You mean for work in your factory?

General FLAGLER. Yes.

Mr. GROUT. Then you think they would not be able to complete delivery before 1903, the time specified?

General FLAGLER. They might be able, but they might not wish to hasten it. They would like to hasten it now, because they have not much to do and they want to run their establishment to the full capacity on these guns. They have just come to me in the last few days with this proposition.

Mr. GROUT. Now, you have not told me how much more the gun factory is capable of doing than you have estimated for here?

Mr. LIVINGSTON. He estimates up within a margin of its capacity.

Mr. GROUT. I understood it, but he said something from which I inferred—

General FLAGLER. You might add to that estimate about 8 per cent.

Mr. GROUT. That is, add to your estimate about 8 per cent which will bring it up to the capacity of the gun factory?

General FLAGLER. Yes, sir; working eight hours a day and that would keep us busy every day in the year.

Mr. LIVINGSTON. Now, then, if you wanted more guns made you would have to increase the hours of labor?

General FLAGLER. Yes.

Mr. LIVINGSTON. That you could do by making it twelve hours instead of eight hours and by working a double force?

General FLAGLER. It would be better to make it ten, and then after that we had better make it sixteen, as the operators can work very well for ten hours, which makes it a day and a quarter. If we want to work more than that we would have to have two shifts, working eight hours a shift, and making sixteen hours a day.

Mr. GROUT. With the two shifts, then, you could double the estimate, and then you could add 16 per cent to that?

General FLAGLER. Yes; about that.

Now, there are several other items I have not mentioned. One is the powder which is a necessary component of any of our material of war—seacoast, field, or siege. There are also the projectiles and estimates for testing and proving the guns, powder, and projectiles.

The CHAIRMAN. If there are no general questions, perhaps we had better take up these specific items. Have you any additional explanations you desire to offer other than is indicated in the bill in regard to this first item?

General FLAGLER. No.

GUN FACTORY, FINISHING GUNS AT.

Mr. LIVINGSTON. If we give you the \$343,168, how many 8, 10, and 12 inch guns will this complete?

General FLAGLER. Twelve 8-inch guns, fourteen 10-inch guns, and eighteen 12 inch guns.

Mr. GROUT. When would you have these guns ready for action?

General FLAGLER. At the end of the fiscal year.

Mr. GROUT. Not before, probably?

General FLAGLER. Some of them would be delivered before.

Mr. GROUT. Could you get your forgings and everything in, so as to turn these guns out?

General FLAGLER. Yes; and I will say a little more on this subject when you come to the next item, which is about the forgings.

Mr. CANNON. I would like to ask one or two questions on this item. You say with this full amount of \$343,168 and the full amount of the item for forgings that that would meet the increase of work at Watervliet, and to get your forgings from Bethlehem would mean slower work for Bethlehem on their gun contract?

General FLAGLER. Yes; I think it would give them so much to do on forgings that they would not press us to accept and pay for guns faster than the contract requires.

Mr. CANNON. Precisely. Now, I want to ask you what is the comparative cost of the Bethlehem guns, under the contract, with the guns that you assemble at Watervliet. Which is the cheaper?

General FLAGLER. Our guns are the cheaper; I forget just how much.

Mr. CANNON. You have answered that they are cheaper?

General FLAGLER. They are much cheaper. They gave us a schedule of bids—I think there were six—at different rates of delivery, and the quicker the delivery the higher the price. My impression is that the quickest delivery they proposed to do their work was about 25 per cent higher than our price, and with the slowest rate of delivery, which we accepted, it was about 8 per cent higher.

Mr. CANNON. Are the guns under contract and the guns you are making at Watervliet about equal in quality?

General FLAGLER. About.

Mr. CANNON. You have, however, in consequence of that contract, a second gun establishment; the Government has one and you have one at Bethlehem?

General FLAGLER. Yes.

Mr. CANNON. I want to ask a question, both as to this item and as to the forgings. If this work is authorized with an appropriation of \$343,000 will the whole of that money be paid the coming fiscal year? You can answer that at your leisure.

General FLAGLER. Yes.

Mr. CANNON. Or will a portion of it be paid the next fiscal year?

General FLAGLER. It will all be paid out this fiscal year; that is, for labor at the gun factory, shop expenses.

Mr. CANNON. I will ask you that same question, or some gentleman will no doubt ask it if I do not, when you come to the forgings; in other words I want you to separate these items through this estimate, and inform the committee accurately what is the smallest amount of money you can get along with under this estimate which will be paid out the coming fiscal year, and what amount could be placed under contract which would accrue by virtue of that contract the coming fiscal year.

General FLAGLER. That can be done, but I hoped it would not be required again. Mr. CANNON. If the contract is made and the appropriation is made in time to meet it, why not?

General FLAGLER. Well, it has been done and we thought it a rather bad way. It has been done twice.

Mr. CANNON. It operates very well all along the line of public service and, frankly, you come here and ask us to treble the appropriation and more, too; and possibly it may be the sense of Congress to do that or something more radical, but naturally we want to keep our bills down—make them sufficient, but keep them down—so far as the actual appropriation is concerned, with the service for the coming year.

General FLAGLER. I can tell you pretty closely now.

Mr. CANNON. You can tell us when you revise your statement.

The CHAIRMAN. In that connection will you kindly indicate what portion of the work could be put under the continuing contract system, if any?

General FLAGLER. Yes; I know what Mr. Cannon means. Would you like me to call your attention to anything of the same kind as we go along?

The CHAIRMAN. Yes, sir; and, in conclusion, I would like to have you sum up the proportion of it.

General FLAGLER. Yes; I will have to do that in my office, and divide up the money falling due before June 30, 1897, and that falling due later.

Mr. CANNON. In making up the total amount of work under this appropriation you had better add to it a statement of the amount of guns that will come under this contract in addition to the amount you will have from Bethlehem, so you can show the full amount of guns you will get the coming year under this appropriation now being made.

General FLAGLER. Yes, sir.

Mr. LIVINGSTON. I see these 44 guns under this contract will cost \$7,797 apiece, and I want to ask this question: Can not you build them cheaper at your own factory? What is the relative cost of these guns between your factory and the one at Bethlehem?

General FLAGLER. The 8-inch guns will cost \$2,029 more, the 10-inch guns will cost \$5,875 more, and the 12-inch guns will cost \$5,790 more.

Mr. LIVINGSTON. Why can not you reduce that contract to that level; why pay them more for the guns than it costs to make them at home?

General FLAGLER. You would have to repeal the law and break up the contract and settle with them?

Mr. LIVINGSTON. The contract specifies the amount of each gun?

General FLAGLER. Yes.

Mr. LIVINGSTON. Have you developed the fact since then that you can make them cheaper?

General FLAGLER. Congress was informed that we could make them cheaper at the time.

The CHAIRMAN. Mr. Cannon has asked you to state the figures, giving the amount of money which will be required during the next fiscal year. I wish you would also, in making these figures, give us the amount which would be spent from July 1, 1896, to March 4, 1897, and also then as to the entire fiscal year.

General FLAGLER. Yes.

The CHAIRMAN. What we want to know is the exact amount of money you can expend under these estimates up to March 4, 1897.

General FLAGLER. I will do that, although you notice my estimates are for what will be required for the next fiscal year.

The CHAIRMAN. We want that, and we want to find also what portion you can expend up to March 4?

General FLAGLER. I understand that, but you must know when I come to these forgings it will be only an estimate. I do not know at what rate the contractors will agree to deliver, but we know their resources and can estimate closely.

The CHAIRMAN. Now before you leave this matter of these guns I wish to ask who bears the expense of these tests and proofs. As I understand it the gun factory at Bethlehem tests the guns.

General FLAGLER. No.

The CHAIRMAN. After you receive them you prove them, as you call it?

General FLAGLER. We do not test them. The difference between prove and test is this: We prove all guns; we fire these guns 10 rounds as a proof, and we take a type gun and test it to extremity, probably firing from 350 to 500 rounds.

The CHAIRMAN. Does the Bethlehem Company bear the expense or the Government?

General FLAGLER. The Government bears that expense.

The CHAIRMAN. Is that provided by the terms of the contract?

General FLAGLER. Practically so. They do some of the work and get paid for it, and if it is not done they do not get paid. They have to furnish the projectiles, we

furnish powder, and if that is not done they do not get the money. It is all paid for out of the Government funds, and if the work is not done it is not paid for.

The CHAIRMAN. So all the expense falls in the last analysis on the Government?
General FLAGLER. On the Government.

SIXTEEN-INCH GUNS.

The CHAIRMAN. Now, let us proceed to this next item of forgings where I see you have estimated for \$1,332,038. Now, explain how much of that is on account of these 16-inch guns?

General FLAGLER. \$115,000 of that.

The CHAIRMAN. What have you to offer on the question of the advisability of these 16-inch guns, having special reference to the discussions of that matter?

General FLAGLER. It is a matter of such importance that I would not like to give the reasons for its advisability without some preparation. If the committee consents, I would prefer to read what I say on that subject in my last annual report, where the reasons for it are briefly stated.

"A type 16-inch gun.—The Board on Fortifications or Other Defenses of 1886 appointed under the act of Congress of March 4, 1885, adopted 44 16-inch guns as a part of our coast defenses, and designated the harbors for the defense of which these guns were to be used. For carrying out the provisions of this report this Department has several times submitted to Congress an estimate for funds for the construction of a type 16-inch gun, but the necessary appropriation therefor has not yet been made. It is believed that this failure of Congress to make the necessary appropriation is partly due to opinions expressed by persons who are opposed to the adoption and use of the 16-inch gun, and who profess to believe that the 12-inch gun has sufficient power for our needs. I do not know what arguments have been used to enforce this opinion, and can not, therefore, combat such arguments. The refusal of the necessary appropriation does not, however, relieve this Department from responsibility in the matter, and I deem it a plain duty to submit here some of the more important reasons for urging immediate preparation for producing guns of this caliber.

"The question of the comparative advantage of guns of the largest or of a smaller caliber for the coast defense has sometimes been confused with the same question applied to naval guns, and the opinion formed against them for naval use has been, without sufficient thought, improperly extended to coast-defense use. The cases are so totally different that arguments applicable to the one case are not applicable to the other. The Navy is limited by the weight which can be conveniently carried or economically provided for, by the length which is admissible, by convenient provision for handling and protecting, and by provision which can be conveniently or economically made for strains due to recoil. Our coast defenses are not so limited in regard to any of these provisions. The naval gun is on a movable support, and can be placed in such proximity to the enemy for fighting purposes as the caliber of the gun and the circumstances of the case demand and will give the best results. The army gun is on a fixed platform, and must fight the enemy at such long ranges as the latter may select within the limits of water that will float his vessel. Many foreign governments carry the large-caliber guns on their vessels, and could sometimes select positions and long ranges at which their large guns would be effective, but at which our smaller guns would not be sufficiently effective.

"The Army will, therefore, sometimes require the power of the larger gun, while there is not such necessity therefor for the Navy. The objections to the gun which are important to the Navy do not exist or are comparatively unimportant in its use by the Army.

"The principal foreign powers have guns of 16-inch or larger calibers in their coast defenses, navies, or in both.* The fact that they have them in their defenses shows their opinion on this subject. The fact that they have them in their navies shows that it is important that we be prepared to compete with their fire, for the reason stated above.

"This Department has never had any doubt of the necessity for the 16-inch gun, nor of the wisdom of its adoption by the Board on Fortifications or Other Defenses in 1886. Since the date of the report of that Board the history of Gun r. Armor has steadily shown an increased necessity for a gun of as high power as that of the 16-inch caliber. Granting what was perhaps true nine years ago, that the 12-inch gun could, under favorable circumstances—that is, at close range and with the ves-

* England has in her coast defense and navy 16 guns of 16 inch and larger calibers and 52 of 13½-inch caliber. France has 8 of 16½ inch, 6 of 14½ inch, and 35 of 13½-inch calibers. Italy has 25 of 17 and 17½ inch, and 35 of 13½-inch calibers. Denmark has 14-inch caliber guns. Our best information shows that Germany, Russia, and Spain have 14 inch, 14½ inch, and 15½ inch guns in their coast defenses, but we have not information in regard to the numbers.

self's side normal to the trajectory—penetrate any armor then in existence, or, under less favorable circumstances and at longer ranges, destroy any vessel by continued hammering, later experience shows that this is not the case with modern armor now. Moreover, the enemy will not place his vessel exactly in the position desired as we place a plate for experimental firing, and the problem in most cases is to destroy a vessel which is doing its best to run past our batteries. Only a small number of shots can be fired from any one gun at a passing vessel, and to accomplish the required amount of hammering a great many 12-inch guns would be required. Not more than one moderately fair hit would be required from the proposed 16-inch gun to destroy or stop any vessel known at the present time. There are sites for our fortifications where one 16-inch gun should be the equivalent of a dozen 12-inch guns, and as the question reduces itself to one of dollars and cents, the 16-inch gun is the more economic gun for the work in hand.

"Some of the latest experiments indicate that even with continued hammering with the 12-inch gun we can not expect to penetrate the best modern armor, and could not destroy or stop certain vessels, except by a rare and exceptionally lucky hit in some weak spot. The report of the Chief of the Bureau of Ordnance of the Navy for this year will show that in some late experiments at Indian Head it was utterly impossible to penetrate modern heavy armor with a 12-inch projectile fired under the most favorable circumstances at a range of only 130 yards and with the plate held normal to the trajectory. In some cases a 13-inch projectile barely got through the plate under the same favorable circumstances. In some later experiments with a modern plate the 13-inch projectile passed through, while the 12-inch produced little effect.

"This Department again submits in its estimates for this year an item for the manufacture of a type 16-inch gun. After an appropriation is made it will require about three years to procure the forgings (forgings of a magnitude not heretofore made), to finish and assemble the gun, and to subject it to the tests required by law for a gun of new type. No 16-inch guns can be adopted and manufactured for service until the preparation and test of this type gun is completed. This action does not commit the Government to the adoption and manufacture of 16-inch guns for the service at the expiration of the three years if they are not then wanted. It is deemed certain that they will not only be wanted, but that they will become an imperative necessity. It would be an act of plain wisdom and forethought to advance by three years our condition of preparation for producing the guns, if wanted, by commencing as soon as possible the manufacture of the single type gun required for this purpose."

I would like to add, in addition, that since writing that report the necessity for the 16-inch guns has been constantly forced upon my mind and upon the Department; and, gentlemen, there is another view of the subject which should be called to your notice. The report of the Endicott Board embraces 44 of these guns. (The Engineer and Ordnance Departments, working together, have been able to reduce the number of these guns to 36, without diminishing the efficiency of the defense to be provided.) Some of the important points on our coast are to be defended by these guns, or, speaking more correctly, they constitute the most important part of the defense of some of the most important harbors. If they are left out, the defense of those harbors will be somewhat in the condition of a horse with one leg off. If the 16-inch guns are not to be made, the fact that they are not to be made should be determined and settled positively at once, in order that some other guns may be adopted and other means of defense provided for the positions which have been assigned in the plans to these 16-inch guns. This is a matter of the utmost importance.

In my judgment the 16-inch guns constitute the cheapest method of providing the very efficient defense required at the points selected for these guns. I do not wish to trespass upon the province of the Engineer Department, which would have positive knowledge on this subject. I only state my belief, based on the information I have. If the 16-inch gun is abandoned, then certainly each of the 16-inch guns must be replaced by several 12-inch guns. I know that for some of the sites to which the 16-inch gun has been assigned, there is limited foundation space for the emplacements, or such foundation has yet to be built by dumping rock or other material to raise a foundation above the water. Taking this into account, I therefore think it certain that the cost of the large emplacements required for the large number of 12-inch guns, together with the armament, must exceed the cost of providing the same defense with a larger gun. In fact, I think the armament alone would cost much more for the smaller gun.

Mr. GROUT. What has been done for the 16-inch guns so far?

General FLAGLER. Nothing. I am asking now simply for authority to purchase forgings to make a type gun. I can not conceive of any higher wisdom than to make this little provision for getting ready to make these guns.

Mr. CANNON. The forgings will cost \$115,000 for the type guns?

General FLAGLER. Yes, for the type; but the forgings for subsequent guns will cost much less. In providing for the manufacture of this type gun you are not even committing the Government to the policy of manufacturing the guns hereafter. If anything should transpire during the three years that are required for the manufacture and test of this type gun which would diminish the necessity for it, the guns would not be manufactured; but history shows that we should expect the necessity to go on increasing instead of diminishing. I can not state too strongly the imperative necessity for the manufacture and test of this one type gun and thereby advancing by three years the preparation for providing this most important part of our coast defense. I shall feel that I was shirking my duty if I did not urge these views upon the committee.

FORGINGS FOR GUNS.

The CHAIRMAN. Now, let me ask you this: In securing these forgings, could you, to advantage, make a regular contract? This is all contract work, as I understand.

General FLAGLER. Yes; contract work altogether.

The CHAIRMAN. Could you, to advantage, make a contract for a definite amount to be delivered as you needed it or during the next fiscal year in advance; and if so, for what sum could you most advantageously make the contract? Is it any advantage just to make this specific sum, or would you want to have appropriated a less sum or a greater sum?

General FLAGLER. A little less or a little greater would not affect it. But if the contract is very small we have to pay more. If it were larger than these estimates call for I do not think the price would be any less. It is large enough to be as advantageous to the contractor as any larger amount would be.

The CHAIRMAN. And this amount of forgings corresponds to the other estimates which you have made here?

General FLAGLER. Exactly. I must not be misunderstood. All of the forgings estimated for will not be used—that is, finished and assembled into guns—during the fiscal year. Some of them will be used and we will have some on hand at the beginning of the year. It is necessary that we provide with absolute certainty by contracts to have a sufficient supply of forgings always on hand to prevent the possibility that the gun factory may have to shut down and wait for forgings. A gun can not be commenced until all the forgings for that gun are on hand. Some of the larger forgings can not be delivered until eighteen months after a contract is made. The resources of the steel makers are carefully considered as well as the requirements of the gun factory, and these estimates for forgings are carefully made to provide for such deliveries, some of them a year and a half in advance, as will insure that the gun factory will not have to shut down and wait for forgings. It is a matter requiring much close figuring and attention to details.

The CHAIRMAN. Also in extending your remarks please indicate the part of your estimate which you would need to actually expend before the 4th of March, 1897, and what portion you would expend later in the year?

General FLAGLER. That I will give you in a written statement:

(This information, furnished subsequently, is as follows:)

There will be required to pay for forgings to be delivered prior to March 4, 1897, \$490,000.

There will be required to pay for forgings to be delivered under contract subsequent to March 4, 1897, \$842,038.

The CHAIRMAN. Then it would be just as advantageous to the Government to make a contract for the entire amount that you desire and make the appropriations for the amount which is to be delivered up to March 4, leaving the residue to be provided for later, in accordance with the terms of the contract which you made?

General FLAGLER. Yes.

The CHAIRMAN. Will you also state the quantity of the several calibers which are covered by this paragraph? You have already stated as to the 16-inch caliber.

General FLAGLER. Yes. Twelve sets of 8-inch, 18 sets of 10-inch, 18 sets of 12-inch, and 1 set of 16-inch.

CARRIAGES FOR GUNS.

The CHAIRMAN. Then pass to the next paragraph, "for purchase and manufacture of carriages for mounting seacoast guns of 8, 10, and 12 inch calibers."

Mr. LIVINGSTON. If we give you the first appropriation, you must have this, and in proportion we cut the first item we can cut this?

General FLAGLER. There is a little to be said about these carriages. We are behind the guns very much on the carriages.

Mr. GROUT. How many carriages will this \$989,500 make?

General FLAGLER. About nineteen 12-inch, eighteen 10-inch, and forty-six 8-inch. Now, gentlemen, I would have to use that money a little different from that estimate.

This estimate was made last summer. Since that time the Engineer Department has accepted my proposition to furnish to the Engineer Department 12-inch disappearing carriages. We are prepared now to give them the 12-inch disappearing carriages; if we do that it saves the Engineer Corps, and of course saves the Government, perhaps \$200,000 per gun in the cost of their fortifications and that gun lift which was the prior plan for the 12-inch gun. The plan now saves the gun lift and the fortifications for protecting it, and we give them the disappearing carriage. The disappearing carriage will cost about \$10,000 more than the old gun-lift carriage, but for this \$10,000 we save about \$200,000 on the lift and fortifications. This estimate was for nondisappearing carriages. I will not be able to make so many of these 12-inch and I may have to reduce a little on the others.

The CHAIRMAN. Will the disappearing carriage decrease the estimate on this item?

General FLAGLER. No, I will not be able to provide so many carriages as I told you; because I will have to make that more costly disappearing carriage.

Mr. GROUT. But it saves in the engineering estimate on the lifts?

General FLAGLER. It would cost me about \$10,000 more, but it would cost the Engineering Corps about \$200,000 less.

Mr. CANNON. In the estimates heretofore the lifts were under the engineers?

General FLAGLER. Yes, sir; they furnished the lifts.

Mr. CANNON. And their estimates are for lifts?

Mr. LIVINGSTON. General Craigbill stated yesterday they had built one, but they expected to stop building them.

Mr. CANNON. I understand these carriages are to be built by contract?

General FLAGLER. All except what we can make at the carriage factory, which is about one-third.

Mr. CANNON. In how many places can you make carriages, the object being to see merely whether you have competition?

General FLAGLER. There are three establishments which are entirely satisfactory.

Mr. CANNON. You have full competition?

General FLAGLER. Yes, sir; there are two more that could take it up.

Mr. CANNON. Do you make them by contract as cheap as you can make them yourself?

General FLAGLER. When I say no, it may be subject to criticism. They took the bids the last time at an astonishingly low price and they found they could not make them at that and they tried to get out of it. Also since that time the price for steel castings has gone up; still I can say we can make the carriages cheaper than they can.

Mr. CANNON. One question right there, if you will allow me to ask, switching a little off from this, and which I want to ask very briefly and get you to answer very briefly. I understand the Government has spent some \$8,000,000 or \$10,000,000 at Rock Island; can that ever be utilized?

General FLAGLER. Yes.

Mr. CANNON. Are you ever going to build any carriages there, or guns?

General FLAGLER. We never contemplated building guns, but we will build carriages very largely.

Mr. CANNON. You do build carriages now?

General FLAGLER. Yes; we are building our field and siege carriages there, and manufacturing all our equipments for the whole Army there.

MORTARS, TWELVE-INCH.

The CHAIRMAN. Go to the next paragraph, "For purchase and manufacture of steel breech-loading mortars of 12-inch caliber."

Mr. LIVINGSTON. We have not given you anything since 1893. I suppose you are willing to go along as you have gone?

Mr. CANNON. Are these mortars made by contract?

General FLAGLER. We would contract a portion if we should get the whole appropriation; otherwise we would make them at the gun factory.

Mr. GROUT. How many would you make?

General FLAGLER. About 60 mortars and 60 carriages.

Mr. GROUT. How many mortars are there now, of this class particularly?

General FLAGLER. Seven.

Mr. GROUT. There are a lot, also, of these old cast-iron ones?

General FLAGLER. Yes, 72; they are not so very old, though. They have a range of 6 miles. In my long statement about this item I called attention to the fact that it is just as important as the sea-coast part of the estimate.

Mr. CANNON. That is the mortars?

General FLAGLER. Yes, sir; and it becomes more important now because the engineers are building these emplacements and are waiting for these mortars.

Mr. LIVINGSTON. What will be the difference between the steel mortar and the iron, steel bound—I mean in regard to cost; is it not about double?

General FLAGLER. No; it is about \$6,000.

Mr. LIVINGSTON. Well, nearly double; \$7,500 for the iron mortars, steel bound, and the others cost \$13,000.

General FLAGLER. We will probably get them cheaper by putting out a good contract.

The CHAIRMAN. What is the relative efficiency of the two guns; which is cheaper in the end, considering the efficiency in power?

General FLAGLER. Why, the steel gun is. You can hardly compare it; the power is greater, but the reliability is the matter that is most important, and there is no question about its reliability. We can use a larger projectile containing a larger amount of high explosives and obtain a mile more range and get greater efficiency in every respect. The personnel of the battery will be without the slightest apprehension of an accident.

Mr. GROUT. That is from the steel guns?

General FLAGLER. From the steel guns.

Mr. GROUT. How many of the others have actually gone to pieces?

General FLAGLER. None of them.

Mr. GROUT. How many were cracked?

General FLAGLER. None.

Mr. GROUT. How many have been put to supreme test—to the extremity test?

General FLAGLER. Two.

Mr. GROUT. How many rounds?

General FLAGLER. Four or five hundred.

Mr. LIVINGSTON. I do not understand that it is in evidence that the steel gun is a more desirable gun?

General FLAGLER. When we first commenced the coast defense we had no provision or means in this country for making any kind of steel guns. We knew we wanted steel guns, but we were not ready; but we wanted to do something and we were able to make these mortars. We said we would go ahead and make them if they will answer our purpose until we are ready to make the steel mortar, and then we said we would stop as we wanted to make the best. It is economy, it is common sense, to make the best. We have got to spend \$6,000 more on the gun itself; but I suppose when the gun, platform, carriage, fortification, ammunition, etc., is taken into consideration, \$6,000 would not be 6 per cent on the whole plant. Our plant is probably 60 per cent better, and it is going to cost 5 or 6 per cent more; that is all. To sum it up, we ought to make the best thing anyway. If we make these cast-iron mortars, in the future they will be thrown out because we are able to make something better.

The CHAIRMAN. I understand the tests have been made, and these steel guns have a range of 1 mile further, and you say they can use larger projectiles with a higher grade of explosive.

General FLAGLER. Yes; a larger charge of explosive.

The CHAIRMAN. This is, of course, a fact which has been decided by tests about which there can be no sort of controversy?

General FLAGLER. Yes.

Mr. LIVINGSTON. How many did you say you had of them?

General FLAGLER. Seven.

The CHAIRMAN. Your recommendation is to build the steel mortars?

General FLAGLER. I should protest against making the cast-iron guns at the present time.

The CHAIRMAN. In the next item for carriages, do I understand they cost more or are the same as for the cast-iron guns?

General FLAGLER. It is practically the same carriage.

Mr. GROUT. Have you carriages for the seven you have?

General FLAGLER. Yes.

Mr. GROUT. Where are these?

General FLAGLER. They are not mounted yet, because these mortars are placed in batteries of 16, and we can not use the 7 until we have 9 to make up the 16.

Mr. GROUT. Where will the first block be located?

General FLAGLER. I forget just what the engineer's plans are. They are building the emplacements for 3 of these batteries, which take 48 mortars. They have got 4 already in operation. I remember that one of the new batteries for which mortars are required is at Charleston, S. C.

The CHAIRMAN. What proportion of these would you expect to obtain by contract, if any, and the estimated cost; and what part would you manufacture in our own gun factory?

General FLAGLER. I would contract nearly all of these, because it would be better for us to manufacture the more difficult sea-coast carriages.

The CHAIRMAN. Do you contract for both carriages and mortars, or mortars alone?

General FLAGLER. We contract for some mortars and nearly all the carriages.

The CHAIRMAN. What time would be required to deliver these?

General FLAGLER. They would not all come in during the fiscal year.

The CHAIRMAN. Will you also make your estimate based upon the amount which would be expended by the proposed estimates before March 4, 1897?

General FLAGLER. I will do that on every item when I return to my office. I will give also the amounts required for the fiscal year—

GUNS MANUFACTURED BY CONTRACT.

The CHAIRMAN. Not only during the fiscal year, but up to March 4, and also for the fiscal year. In other words, you must assume that there will be another appropriation act which will take effect March 4, which will cover the matter. Now, proceeding to the next item at the bottom of page 5, "For 8, 10, and 12 inch guns manufactured by contract under the provisions of the fortifications act, etc.," I understand this is the Bethlehem Iron Company's contract?

General FLAGLER. Yes. Do you want to consider this request of the company that the appropriations be provided for paying faster than the contract requires?

Mr. CANNON. But you say if we give the other appropriation we will utilize that on forgings?

General FLAGLER. Yes.

Mr. GROUT. On that question of appropriation, let me ask, is this from the statement made by them that if you call for these castings they will not hurry you on the delivery of the guns?

General FLAGLER. No; that is my own idea.

Mr. GROUT. That is a matter of reasoning with yourself?

General FLAGLER. Yes.

Mr. GROUT. Now, is your knowledge of the plant such that you can say they cannot be able to furnish all the forgings you want—by the way, do all your forgings come from that concern?

General FLAGLER. No.

Mr. GROUT. Well, all the forgings you want of them and still be ready to deliver their guns ahead of time?

General FLAGLER. My knowledge of their establishment is such that I think if this appropriation be given for all forgings that are estimated for they would not be able to furnish as many forgings as we want them to furnish if they are going to press the work on the guns.

Mr. GROUT. Do other concerns furnish forgings?

General FLAGLER. Yes; but we would not get the benefit of as good a price, Mr. GROUT. When this work was commenced, if your mind goes back to it, you will find there was much discussion in regard to the propriety of having private parties furnish the steel forgings instead of making them ourselves, and when the first appropriations were made very large contracts were necessary to warrant private parties to incur the cost of erecting the great and expensive plant required for manufacturing the forgings, and the prices paid had to be high enough to remunerate them for putting in their plant. Now they have the plant in, we have some claim upon them; that they should furnish forgings and furnish them cheaper than firms who have not the plant and would have to incur the cost of erecting a plant.

Mr. GROUT. This is not the only establishment?

General FLAGLER. That and the Midvale are the only establishments that now furnish forgings. I presume, if this appropriation is made, it will bring in others—probably Carnegie.

Mr. GROUT. Have others made bids before?

General FLAGLER. I believe not.

Mr. GROUT. Only Bethlehem and Midvale?

General FLAGLER. The Cambria Company and Carnegie both made propositions when information was being collected as to the propriety of having the Government make its own forgings or purchase them. They answered a long series of questions as to what they could do and proposed to do.

Mr. GROUT. To get back to that point, because it is a question of how fast this work can be proceeded with or completed, you say, then, if this entire sum was appropriated, and this large number of forgings called for, it might call in other competing plants outside of Midvale and Bethlehem?

General FLAGLER. I think it would; and, moreover, Bethlehem should be in a condition to compete, with their completed plant, and keep the price down. If they can employ their plant on something else they may not agree—

Mr. GROUT. How extensive is the Midvale plant?

General FLAGLER. I should think it about one-half the capacity of Bethlehem.

Mr. GROUT. In letting this, do you let them all to the same concern, or do you divide it?

General FLAGLER. We divide it.

Mr. GROUT. There are practically those two plants, and there might come in the Carnegie and the Cambria Iron Works, making four in all, and that would probably be divided among them all?

General FLAGLER. That would depend upon the price.

Mr. GROUT. Of course. Suppose somebody else bid less on these forgings—some one of these other three concerns—then they would be likely to still ask you to take guns in advance of time; so that is a matter of uncertainty?

General FLAGLER. Somewhat.

Mr. CANNON. How somewhat, when Bethlehem has a complete plant and Carnegie would have to make a plant? Now, why would Bethlehem be such a fool as to stand around and let Carnegie underbid them when they have already gone to such enormous expense to make this steel as cheap as they can?

General FLAGLER. They will undoubtedly do what they can to keep the prices up.

Mr. CANNON. And you do not want to help hold them up?

General FLAGLER. That is what I wish to avoid.

The CHAIRMAN. Are there any factories on the Pacific Coast which could furnish forgings?

General FLAGLER. They are not in condition to do it now, but I presume the Union Iron Works could, though they would have to take the stock across the continent. They have not the stock to make the grade of steel we require on the Pacific Coast, and we would not want the forgings there unless we had a gun factory there.

Mr. GROUT. Have you shipped any guns to San Francisco?

General FLAGLER. Yes.

Mr. GROUT. How do you ship them?

General FLAGLER. We ship them across by rail.

Mr. GROUT. Is that cheaper than going around the Cape on a sailing vessel?

General FLAGLER. Everything considered, we think that is the better way, considering the safety and early delivery, and you know the railroad companies take freight in that direction cheaply; and there is a refund on the land-grant railroads.

The CHAIRMAN. You think it is not possible to avail ourselves of the Bethlehem's offer to expedite the delivery of the guns from that factory?

General FLAGLER. Yes; but it requires a large addition to the appropriation for payments this year under their contract, and I desire you to have all the facts to enable you to decide whether it would be to our advantage.

Mr. GROUT. It would be if you wanted the guns?

General FLAGLER. Yes.

Mr. GROUT. It does not involve any increase in price?

General FLAGLER. No.

Mr. GROUT. It is the question of expediting the time of delivery, and thus also make an earlier call on the Government for money to pay for them, and I suppose that is all?

General FLAGLER. Yes; if an emergency were to arise we would want very much to take advantage of their offer, but as the matter stands I do not know that we shall, but I think it is my duty to tell you what they offer and what money it will take to carry out their offer.

The CHAIRMAN. Does the contract provide for an expedited delivery?

General FLAGLER. No; it specifies the rate of delivery which they must comply with. It is generally understood that anyone may deliver faster if they choose, but this contract does not say so.

The CHAIRMAN. In the event the delivery was expedited it would involve no larger cost to the Government?

General FLAGLER. No more cost, but you would have to appropriate the money sooner.

The CHAIRMAN. That is the only difference.

General FLAGLER. They estimate they can furnish us guns to the amount of \$565,593.19 more than I have estimated, and I have estimated \$497,499, making the total amount required to pay that company during the next fiscal year \$1,061,000.

The CHAIRMAN. That would be within your estimate, which is about ten times as much as the amount appropriated for the current year.

General FLAGLER. But they did not commence completing guns to any extent until now. They are just well under way now. Up to the end of this fiscal year the deliveries required by the contract amounted to \$200,000. The next year the contract would require deliveries amounting to \$497,000, and they want to deliver about a million dollars' worth.

The CHAIRMAN. Then this amount in your estimate of \$497,000 is strictly in accordance with the terms of the contract which can not be reduced?

General FLAGLER. It can not be reduced; the law requires it.

WIRE-WOUND GUNS.

Mr. CANNON. Let me ask a question here which occurs to my mind now in reading the evidence before the coast defense committee of the Senate. They speak here of

wire guns, and Mr. Brown, or somebody else, says the wire gun is the better gun. I ask what you state about it?

General FLAGLER. All I think necessary to say on that subject is stated carefully in my last annual report.

Mr. CANNON. Then I will not ask you because I can read it.

General FLAGLER. I can state it here.

Mr. CANNON. I ought to have read it.

The CHAIRMAN. Just in that connection make that a part of your answer.

"EXPERIMENTAL GUNS.

"Crozier 10-inch wire gun.—This gun has been fired 210 rounds to date, and is apparently in good condition. The bore of the gun has enlarged more than that of the 10-inch hooped gun type, but it is much less scored and eroded, notwithstanding that the average pressure has been higher than in the 10-inch hooped gun. The tube of this gun was procured from the works of Le Creusot, France. As stated in my last annual report, the Ordnance Department has since 1876 made tests of four wire guns in addition to the Crozier wire guns now under test. As stated, all of these guns were manufactured by the Department except the 5-inch Brown segmental gun. All of the guns except the one still under trial have failed, but the 5-inch Brown segmental gun shows good endurance.

In power and endurance the Crozier gun has made an admirable record, and although its test is not yet completed, it has proceeded far enough to demonstrate and prove that this wire-wound gun has or that wire-wound guns made on this particular system can be made with sufficient endurance and stability. It has not yet been shown and should not be claimed that in power and endurance this system has any valuable advantage over the built-up hooped gun of the service type; in structural stiffness it is somewhat inferior to the service type.

The material and important question then remaining to be settled is the comparative cost of guns made on this system and built-up hooped guns of the service type. It has been claimed by the advocates of wire-wound guns that they are the cheaper, but the circumstances under which this particular gun was manufactured are such that we have not sufficient data on which to determine the cost of this gun manufactured in quantities or to arrive at any definite conclusion in regard to the comparative cost of guns made on the two systems.

It is very important that this question of cost should be accurately determined. The power and the endurance of the gun having been satisfactorily proved, there is no objection to placing a limited number of this type of gun in service. The question of comparative cost can be satisfactorily settled only by manufacturing a limited number of these guns at the gun factory where the hooped guns are being made, under the same economic conditions and by keeping a careful record of the cost. With this very important object in view, a provision has been inserted in the estimates for the next fiscal year, under the item for steel forgings, for authorizing this Department, in the exercise of its discretion, to manufacture a limited number of this type of wire-wound gun."

Since the above was written this gun has been fired 65 more rounds.

The CHAIRMAN. Now, have you anything further to submit in regard to this Bethlehem company iron contract?

General FLAGLER. No, the amount I have estimated for is absolutely due under the contract. They say they would like to deliver five hundred and sixty odd thousand dollars' worth more, and I inform the committee to see whether they wish to accept that proposition or not.

The CHAIRMAN. Now, the next item is "for necessary expenses other than for powder and projectiles, incident to the test inspection of the twenty-five," etc.

Mr. LIVINGSTON. Is that absolutely necessary?

General FLAGLER. That is absolutely necessary. You understand, when we get the guns they must be proved and inspected.

FIELD GUNS.

The CHAIRMAN. Now, pass to the next item, "for steel field guns of 3.2-inch caliber."

General FLAGLER. All I would say now is what I stated in my general remarks.

Mr. GROUT. How many of the 3.2-inch caliber guns will this \$25,000 make?

General FLAGLER. It will probably make 26, but we say 25. We make them for a little less than \$1,000 apiece.

Mr. LIVINGSTON. Then you have to have the carriages if you get the guns?

General FLAGLER. Yes, sir.

Mr. CANNON. These are what you consider imperative?

General FLAGLER. Yes; as I stated, the estimate is for making 25, and we ought to be making over 100 per annum, and I propose to estimate for that number next year. We ought to have 1,500, and ought to be making at least 100 per annum.

Mr. CANNON. Are these made by contract?

General FLAGLER. No; we make all these ourselves.

SIEGE BREECH-LOADING RIFLES.

General FLAGLER. The first item which I had is "steel breech-loading rifles, siege, 5-inch caliber."

Mr. CANNON. There is no reduction of the estimates on pages 6 and 7?

General FLAGLER. I had an estimate for "steel breech-loading rifles, siege, of 5-inch caliber, \$30,240." It does not appear here.

The CHAIRMAN. Where would that come in?

General FLAGLER. On page 7 below the item for carriages and platforms for steel field mortars. Then I had an item for "steel breech-loading rifled howitzers, siege, of 7-inch caliber, \$30,370." Then, going back to the bill, "for limbers, implements, and equipments for steel breech-loading rifles," etc., my estimate was \$114,140, and it is cut down to \$17,000.

The CHAIRMAN. In view of the changed condition of affairs since the preparation of these estimates, will the War Department please take up the matter of field and siege equipment and furnish us an additional revised estimate?

General FLAGLER. I would like to do it, and I think it would be very wise to do it.

Mr. CANNON. And be prepared when you bring it, not only for an increase in this without any cut on the big guns, but for an increase on this and a comparative cut on the big guns so we can have the whole thing before us from both standpoints. And in that connection let me ask you, suppose war was declared to-morrow could you in thirty days buy these?

General FLAGLER. We could not get any of them in less than nine months.

Mr. CANNON. Well, that tells the whole story.

The CHAIRMAN. In furnishing this revised estimate, also please give in detail the field and siege equipment which would be covered by the estimate?

General FLAGLER. Yes.

The CHAIRMAN. I find in the Senate hearing reference is made to a subsequent estimate for rapid-fire guns, as having been sent to Congress.

General FLAGLER. That estimate was taken by me to the Secretary of War for his approval, and I understood that it had been forwarded by the Secretary to Congress. It should in the regular course be referred to this committee.

Before leaving the subject of the revised estimates which I am to send to the committee, I wish to call attention to one item which has not been mentioned. To meet the requirements of the Engineer Department—that is, to supply emplacements for which they have projects, and for which this Department anticipates appropriations, I need more seacoast carriages than are provided for in my estimate, which was made last July. The apparent intention to press this work makes this a matter of importance. I would therefore ask the permission of the committee to include in the revised estimate, which I am to furnish, an increase of \$125,000 for seacoast gun carriages.

The CHAIRMAN. Please do so.

Mr. CANNON. That is for the big guns?

General FLAGLER. Yes. As I have told you, the construction of the gun carriages for the seacoast guns is about one year behind the construction of the guns, and we will have plenty of guns to meet the probable requirements of the Engineer Department, but not to press the work on the carriages.

Mr. CANNON. I am glad you are behind, because now you come and tell us you can furnish carriages for the 12-inch guns for \$75,000 as against a lift at \$250,000.

General FLAGLER. The adoption of the new carriages will save about \$200,000 on the cost of the lift and the fortification for the same. While the new carriage costs only \$10,000 more than the carriage which was used on the lift, we are able to turn out about 48 guns per annum at the gun factory, and the Bethlehem contract gives us 12 to 15 more, making in all something over 60 seacoast guns per annum. The engineers can at any time prepare emplacements—that is, fortifications—as fast as the appropriations therefor will permit, and this almost without limit. It is important then that I have the increase in the appropriation for seacoast carriages, which has been asked for, in order to meet the demands which the Engineer Department will make upon me in case of emergency or any pressure of seacoast work.

WEDNESDAY, March 4, 1896.

Gen. D. W. Flagler, Chief of Ordnance, and Capt. Charles S. Smith, of the Ordnance Bureau, appeared before the committee.

STATEMENT OF GEN. D. W. FLAGLER—Continued.

General FLAGLER. I will state in regard to the supplementary estimates asked for yesterday that the Secretary of War is out of town and will not return until to-day. The estimates require his approval before it is sent to Congress. I have, however, a copy of the estimates which can be informally laid before the committee for consideration at this time and save another hearing. If the Secretary should not approve the estimates it can be stricken from my remarks. They are as follows:

Additional estimates of appropriations required for the service of the fiscal year ending June 30, 1897, by the Ordnance Department, United States Army.

For steel field guns of 3.2-inch caliber.....	\$25,000
To manufacture about twenty-five guns, including the steel forgings therefor.	
For carriages for field-gun batteries.....	61,000
To provide about twenty-five carriages, complete with limbers and caissons each, and 6 combined battery wagons and forges with tools, for the equipment of the 25 3.2-inch guns under the preceding item.	
For shrapnel for field guns.....	35,000
To procure about 10,000 rounds of steel shrapnel, complete.	
For the purchase and manufacture of carriages for mounting seacoast guns of 8-inch, 10-inch, and 12-inch caliber.....	125,000
For steel breech-loading rifles, siege, of 5-inch caliber.....	30,240
For steel breech-loading rifled howitzers, siege, of 7-inch caliber.....	30,370
For carriages for steel breech-loading rifles, siege, of 5-inch caliber, including implements and equipments, and for carriages for steel breech-loading rifled howitzers of 7-inch caliber, including implements and equipments.	97,140
For siege breech-loading mortars, steel, of 7-inch caliber.....	40,600
For carriages and platforms for siege breech-loading mortars, steel, including implements and equipments.....	31,880
For sights for cannon	800

D. W. FLAGLER,
Brig. Gen., Chief of Ordnance.

OFFICE OF THE CHIEF OF ORDNANCE, March 3, 1896.

FIELD GUNS.

The first item in the supplemental estimate is, "For steel field guns of 3.2-inch caliber, \$25,000." That is practically doubling the amount for the field guns.

Mr. GROUT. Where does that come in?

General FLAGLER. We propose to increase that item \$25,000. That makes that item \$50,000 instead of \$25,000. This requires that the next item for carriages for these field guns should also be doubled. It is now \$61,000; the increase makes it \$122,000.

Mr. GROUT. How many carriages will that \$61,000 make?

General FLAGLER. We require two and a half carriages to every gun, and one mere battery wagon and forge to every four guns.

Mr. GROUT. That would equip your fifty guns you spoke of, under the present estimate?

General FLAGLER. Two and three-quarter carriages per gun are required, which makes about 137 carriages.

Mr. CANNON. Why is it 2½?

General FLAGLER. One carriage to a gun, and a caisson and a half makes 2½, and a battery wagon and forge for every 4 guns makes 2½. The ammunition has become so heavy that where formerly we had 1 caisson to a gun we must now have 3 to every 2 guns. Each battery had formerly a separate battery wagon and forge—2 carriages. We now combine these into one. A peace battery has 4 guns. A full battery would have 6.

The next is perhaps more important than anything else. It is for a supply of ammunition for these guns. We have scarcely any reserve of this ammunition on hand. We ought to procure 20,000 rounds. I have made the estimate for 10,000 rounds.

Mr. CANNON. Where does that come in?

General FLAGLER. "For projectiles for issue to service," on page 9, at the top.

Mr. CANNON. And instead of the \$31,500, it makes the item \$66,500?

General FLAGLER. Yes.

Mr. GROUT. Did you say yesterday how many of these field guns of this caliber and how many siege guns we now have, all told, fit for service?

General FLAGLER. I am not sure; we have 150 of the 3.2-inch.

The CHAIRMAN. You were requested to tabulate it?

General FLAGLER. What I did state was, we ought to have on hand 1,500 of them.

Mr. CANNON. You now have 150?

General FLAGLER. Yes.

Mr. CANNON. That is, steel field guns of 3.2-inch caliber.

General FLAGLER. Yes. Fifteen hundred would be the complement of that artillery for an army of 400,000 men, according to the present custom. Foreign nations are generally using 4 to 6 field guns to 1,000 men. Before the new armament the complement of guns was generally held at 3. I think in this country I would not recommend as high a complement of guns as in other countries where they have better roads, but I think we ought not to go below 3. With this ratio, 1,500 guns would be sufficient for an army of 500,000 men.

Mr. CANNON. Go to the next item.

CARRIAGES FOR GUNS.

Mr. CANNON. On what page?

General FLAGLER. On page 5, second paragraph. As I have told the committees repeatedly, each year, we were necessarily behind in the production of the carriages. The principal reason for this was the necessity for a disappearing carriage. There was no type of disappearing carriage in existence that was satisfactory. We have now designed, constructed, proved, and adopted a satisfactory disappearing carriage and are constructing them as rapidly as possible. There are about five good private establishments ready to make the carriages, besides our own factory. We ought to bring the construction of carriages up to within a year of the guns; that is, we would have a year's product of guns ahead of the carriages.

Mr. CANNON. How long does it take to make a carriage?

General FLAGLER. Commencing about four months after the date of a contract, most of the private establishments would turn out about 6 to 12 per annum, depending on the caliber. We could turn out 12 to 24 at the carriage factory, depending on caliber.

The CHAIRMAN. Now, you say you have a satisfactory 12-inch disappearing carriage?

General FLAGLER. The type carriage of the 12-inch is not completed yet. Its adoption was not decided upon—that is, that the Engineer Department would use the carriage in lieu of the gun-lift—till about three months ago, since that time we have been pressing work on the drawings and patterns. It is precisely the same carriage in all respects as the carriages we have made and are using except that all the parts are enlarged. We think from our experience on the other carriages that this will be more satisfactory than the others. We have the benefit of the experience of the other carriages. We have no doubt of the success of the carriage.

The CHAIRMAN. What will be the cost of the new disappearing carriage?

General FLAGLER. The 12-inch I think is about \$25,000.

The CHAIRMAN. Is it the purpose to construct that in our factory, or is it to be made in private factories?

General FLAGLER. If I can I will make all of these in our gun factory. The reason is that the drawings and patterns are very expensive and I do not like to duplicate them for a private establishment. It is a more difficult carriage to make and we would rather prefer to make it ourselves. More of the 10-inch carriages are required than of the other calibers. Several of the private establishments have now the drawings and patterns for this carriage. There is economy in keeping them on this carriage as it will save the cost of drawings and patterns on future manufactures. Some of the 8-inch carriages must be given to private manufacturers.

The CHAIRMAN. How large a traverse range has your new carriage, 360°?

General FLAGLER. Only 170.

The CHAIRMAN. Not quite half?

General FLAGLER. Not quite half.

The CHAIRMAN. Are there any that have a traverse range of 360° that are successful?

General FLAGLER. That is of the disappearing carriages, you mean?

The CHAIRMAN. Yes, sir.

General FLAGLER. We have completed plans for modification of our service carriage to adapt it for an all around traverse. A very slight modification of our present type is all that is necessary. We have an all around traverse—the Gordon carriage—but we don't like it as much as the service carriage, the one we are making. It is more expensive and not as good. If necessary we can put that in a few sites where the engineers desire an all around fire, but I think the modification of

the service carriage to adapt it for all around fire, which we are now making, will fill all the requirements in this regard.

The CHAIRMAN. Will you state in general terms just what this new 12-inch carriage will be, and to what extent is it purposed to raise the gun?

General FLAGLER. I am sorry I did not bring a drawing, but the principle of the one adopted, I think, is as much as you would want to know. Members of the committee are familiar with the trunnion of the gun and how it is mounted on the top of the carriage. Instead of mounting it on the top of the carriage we put in the ends two levers, and if you are looking at it sideways these levers stand about this angle [illustrating], and the trunnions are mounted on top of these levers. Then these levers come down like this [illustrating]. The trunnions at near the middle point of the levers slide or roll to the rear on what is called the "top carriage." To the lower end of the levers there is hung a counterpoise of, say, 79,000 pounds on the 10-inch carriage.

When the gun is fired the tops of the levers carry it to the rear, and as the levers revolve around their center trunnions on the sliding carriage the gun is thus lowered. The lower ends of the levers at the same time revolve upward and raise the counterpoise. They are controlled by guides which slide in ways, and the counterpoise rises vertically. By a mathematical principle, if the levers were vertical, and they are nearly so, the motion of the counterpoise would be zero when the motion of the gun commences, and this is nearly the case. This principle avoids the enormous strain which would result from a jerk on the counterpoise, and is the important principle of the carriage. The upward velocity of the counterpoise then increases steadily until the motion is ended, and produces no sudden strains.

This counterpoise aids in checking the recoil, but the principal part of the recoil is taken up by powerful hydraulic buffers, which restrain the backward motion of the sliding or top carriage. The maximum force of recoil which must be restrained in the 10-inch gun sometimes exceeds 3,250,000 pounds. These figures give some notion of the force dealt with in a modern high power gun. The object of the counterpoise is to store up so much, and exactly so much, of the force of recoil as is needed to lift the gun to a firing position again after it has been loaded. When the gun is fired it falls 8 feet, and must be lifted up into position again. All this force must be so exactly balanced and controlled that the gun will come down exactly to its firing position and there rest on buffers without thumping, and it must also return quickly and smoothly to this upper firing position again without a thump there. This is what has been accomplished.

When brought down to the firing position the gun and all the parts of the carriage must be below a plane, which falls at an angle of 7 degrees from the crest of the parapet.

Mr. CANNON. What is the motor?

General FLAGLER. Our motor is the powder of the last cartridge that was fired.

Mr. CANNON. What carries it back?

General FLAGLER. The force of the gases from the powder. A portion of this force also lifts the counterpoise, and this stores up work enough to lift the gun up again.

Mr. CANNON. You mean in regard to this lifting and letting it back and that kind of thing that your machinery is so arranged that the force of the powder does it?

General FLAGLER. Yes; the force of the preceding shot.

Mr. CANNON. In the lift what is the motor there?

General FLAGLER. They have boilers, engines, pumps, hydraulic rams, and accumulators.

The CHAIRMAN. Is it not purposed to make more lifts, especially of the expensive sort?

General FLAGLER. The Chief of Engineers informs me he will not make any more.

Mr. GROUT. This is largely a project of General Casey?

General FLAGLER. He was much interested in it, but it is mainly the design of General Duane.

Mr. GROUT. He is very much devoted to it?

General FLAGLER. Yes.

The CHAIRMAN. I understand in the report of the Coast Defense Committee, on page 8, it is purposed there to construct 14 of these lifts?

General FLAGLER. This must be taken from the old tables.

Mr. CANNON. Where have you got one of the disappearing carriages?

General FLAGLER. Five have been shipped to Fort Wadsworth, in the Narrows of New York Harbor. There will be one down the river here at Fort Washington; not quite ready yet, but I think this spring.

SIEGE RIFLES AND HOWITZERS.

Now, in regard to additional estimates, there is an estimate to restore a very small estimate for siege guns and carriages which was stricken out, and they should come in just before the carriages, because there was something left in for carriages.

Mr. GROUT. On what page?

General FLAGLER. On page 7.

The CHAIRMAN. The last item you gave us was an addition of \$125,000.

General FLAGLER. The item referred to is "for steel breech-loading rifles, siege, of 5-inch caliber, \$30,240," and "for steel breech-loading rifled howitzers, siege, of 7-inch caliber, \$30,370." The last item on the page but one should be changed so as to read: "For carriages for steel breech-loading rifles, siege, of 5-inch caliber, including implements and equipments."

The CHAIRMAN. You could add the word "carriages" and leave the same wording.

Mr. GROUT. Have you to add anything besides the word "carriages?"

General FLAGLER. You could insert after "For" the words "carriages and."

Mr. BARTLETT. You might give that in your hearing as you propose it, and when we come to formulate our bill—

General FLAGLER. Would it not be better to take one of these bills and write these things in that the committee agree upon?

The CHAIRMAN. After you have made your recommendation I will ask you to take one of these bills and make your suggestions in the language of the bill.

Mr. LIVINGSTON. How much change do you make in the appropriation of \$17,000?

SIEGE MORTARS.

General FLAGLER. That becomes \$114,140. The next item here that is stricken out in my estimate is, "for siege breech-loading mortars, steel, of 7-inch caliber, \$40,600," which would come in right after the carriages. It is not in the bill at all now.

Mr. LIVINGSTON. How much would you add there?

General FLAGLER. I thought perhaps the committee might like to know the importance of that item?

Mr. CANNON. Give us the amount first.

General FLAGLER. That and the following item, "for carriages and platforms for siege breech-loading mortars, steel, including implements and equipments, \$31,880," could be added together, making in all \$72,480, because you do not want to give one item without the other.

Mr. BARTLETT. That is for steel breech-loading mortars?

General FLAGLER. Yes, sir; for siege purposes.

Mr. BARTLETT. They are lighter than the field mortars?

General FLAGLER. No, they are heavier.

Mr. BARTLETT. They are different in character, these are heavier?

General FLAGLER. The little field mortars two men can pick up and carry.

Mr. CANNON. Now, you stated you wish to explain about the importance of that?

General FLAGLER. None of these mortars have been made, and the remarks I made before the committee yesterday about the character of our new siege artillery apply rather more to the mortars than to the guns, because there has never been a breech-loading mortar until the new armament came in. These steel breech-loading rifle mortars are, I should say, as important a part of the siege artillery as any other, and we have not one except the type which has been made and tested. The carriage has also been made and tested and the implements and equipments proved. We have as yet made none of them. The estimate is for 20.

Mr. CANNON. Is the work to be done at Watervliet?

General FLAGLER. At Watervliet, and it is merely a beginning.

Mr. BARTLETT. Could you make these in a year?

General FLAGLER. Yes; we could make all of these in a year, and more. We have 20 howitzers, and this is to make 20 mortars. That completes that much of the siege artillery.

SIXTEEN-INCH GUN.

Mr. BARTLETT. There is one question I would like to ask you. I was in New York when you were here before, and somewhere in your estimates I noticed last night there is a provision for assembling 16-inch guns; that is, the words "16-inch" are added.

General FLAGLER. That is the second item in the bill.

Mr. BARTLETT. That is for the purchase of the steel for it?

General FLAGLER. Yes.

Mr. BARTLETT. Now, how many guns are to be covered by the quantity of steel provided for there?

General FLAGLER. One.

Mr. BARTLETT. Only one 16-inch, which is a type gun?

General FLAGLER. Yes, a type gun.

Mr. BARTLETT. That is all that is provided for now?

General FLAGLER. We want to buy the steel and get ready to make that type gun.

Mr. BARTLETT. And I understand it will take about three years to make it?

General FLAGLER. About two years and four months and it will take the rest of the three years for the testing of the gun, which the law requires shall be tested before going into service.

Mr. BARTLETT. How many guns are covered by that item of steel?

General FLAGLER. Only one.

Mr. BARTLETT. I mean of the other guns, of the 8, 10, and 12-inch guns.

General FLAGLER. They are estimated to buy twelve 8-inch, fourteen 10-inch, and eighteen 12-inch.

Mr. BARTLETT. And that steel we ought to have at once?

General FLAGLER. We ought to make a contract at once so as to get it as soon as the steel makers can give it to us.

Mr. BARTLETT. Can they give it to us within a year?

General FLAGLER. Some of it.

Mr. LIVINGSTON. Is that the only addition now to the estimates?

SIGHTS FOR CANNON.

General FLAGLER. The increase in the number of guns requires an increase of \$800 also in the amount required for sights.

Mr. LIVINGSTON. You have estimated \$9,200?

General FLAGLER. Yes; it increases the item \$10,000.

Mr. CANNON. There is no further increase for ammunition or anything of that kind. You increase \$10,000 for projectiles, but that is all.

General FLAGLER. There is no increase on this item.

Mr. LIVINGSTON. On page 9, for projectiles, you have added \$10,000.

Mr. CANNON. No; \$35,000.

The CHAIRMAN. Why not include your revised estimate for forgings for these small guns in your general estimate for forgings? Would it not be possible to do that, making one item simply of all these forgings?

General FLAGLER. It could be done, but it makes too many items. It complicates the bill too much and increases the chances of complications and errors in appropriations as passed. As the estimates are prepared as they appear here, if Congress should make any reductions, it reduces the number of guns and the operation is complete. If the finishing and assembling and purchase of the forgings are separated and changes at all made in the estimates, it would be likely to result in not making the two things equal. There might not be enough money for finishing and assembling all the forgings, or not enough forgings to assemble.

The CHAIRMAN. I want to know the simplest way possible, and to get your explanation of why it is not included in the other.

General FLAGLER. Of course we buy these forgings, but it is not a great work like the big seacoast guns, and if we separate them it complicates the bill very much and complicates action. If you wanted to reduce one we have to make a careful calculation of how much it reduces the other so as to come out even, and it will not come out even, because when we get bids they and prices are never exactly what we expect.

FUSES AND PRIMERS.

The CHAIRMAN. Proceed to the item on page 8, "for fuses and primers for cannons, \$3,500." That is a new item?

General FLAGLER. That is all right.

Mr. LIVINGSTON. Does that depend upon additions made largely?

General FLAGLER. No, that was not reduced; and that is the amount we estimated we require for that.

INSPECTING INSTRUMENTS.

Mr. LIVINGSTON. I see you have added "and projectiles" in the next item. That is new?

General FLAGLER. Yes. It is to cover instruments for inspecting, etc. We make the language coincide a little more accurately with what we do with the money. We must have inspecting implements for the projectiles as well as for the guns.

Mr. LIVINGSTON. I see the estimate is smaller than the appropriation for the current year?

General FLAGLER. We are pretty well supplied with these instruments, but we have to get some new ones and repair old ones, and there must be a little money for that purpose.

The CHAIRMAN. Now pass to the next item.

POWDER FOR ISSUE TO SERVICE.

Mr. GROUT. Have you anything to say about the next item, "for powder for issue to service, including metallic cartridge cases for cannon;" I see you estimate \$39,750, and there is an increase there?

Mr. CANNON. The note says it is for field guns.

Mr. LIVINGSTON. General Grout remarks you have made an increase over last year's estimate. Why do you ask an increase over the estimates of last year?

General FLAGLER. That is an estimate for issue to service and includes what is required by the regulations to be issued, and the reason is there are more guns in service than last year.

Mr. GROUT. What is left of this appropriation of last year of \$20,000?

General FLAGLER. There will be nothing left.

Mr. CANNON. He has got an estimate of more than that \$35,000; the revised estimate swells that to \$65,000.

Mr. GROUT. What do you mean by "issue to service?"

General FLAGLER. Issues to the Army.

Mr. GROUT. To the Army generally?

General FLAGLER. That is to supply the guns which are in service.

Mr. CANNON. Giving them 10,000 rounds.

Mr. BARTLETT. Where are these projectiles manufactured?

General FLAGLER. At the Frankfort Arsenal. We issue very little except shrapnel. The modern shrapnel is very expensive.

Mr. GROUT. This is for experimental practice, I suppose?

General FLAGLER. Yes; this is for practice, for target practice and other experimental practice, and it also embraces a reserve supply for these batteries and posts where they are. We wish to accumulate a little there. They are to be sent to these batteries where they are stationed to draw upon if it becomes necessary.

Mr. GROUT. You have brought up your estimate to \$66,500, and your idea is that that will provide more of those projectiles than would be used really?

General FLAGLER. Yes; it will enable us to get some projectiles to put into the arsenals to hold there to be issued in case of an emergency.

Mr. GROUT. What share will compose the reserve?

General FLAGLER. I propose to put all in that would not be used.

Mr. GROUT. What proportion of the \$20,000 appropriated last year was not expended?

General FLAGLER. It will all be expended by the end of the fiscal year.

Mr. GROUT. You are not able to say what portion is expended already?

General FLAGLER. No; but I happen to know the appropriation is nearly exhausted. It would be of advantage to go on with the work now, and we can not.

Mr. CANNON. I expect I ought to know, but I do not. In regard to the ammunition or projectiles you are going to have as a reserve, how long could they run without deteriorating?

General FLAGLER. It is an important question. The new ammunition is practically imperishable. Formerly, powder for the field-gun cartridge was packed in a bag, generally made of flannel. The powder was exposed to damp of not very good magazines at the military posts, but was much more exposed when packed in the ammunition chests of the batteries. Though the exposure might not ruin the powder it must so affect its strength as to give inaccurate and bad results when fired. For the new ammunition the powder is hermetically sealed in a metallic case, and experience shows that it is little, if any, affected by exposure to damp. The cartridge can be left for a time in water without injury.

Mr. BARTLETT. Do the new smokeless powders deteriorate by being kept?

General FLAGLER. We know less about smokeless powders than about other powders, but from each lot of the new powder we store small samples—one on the Pacific Coast, one at the Frankford Arsenal, and one at Sandy Hook—to ascertain the effect of long storage. These samples are tested to determine the effect of storage at intervals of a year.

Mr. BARTLETT. There is no great amount kept in store?

General FLAGLER. None; we have no stock on hand.

POWDER FOR PROVING GUNS.

The CHAIRMAN. Pass to the next item of "For projectiles for the proof of 8-inch, 10-inch, and 12-inch guns."

General FLAGLER. That I suppose is clear to all the members of the committee. If we have the guns, we must have enough powder to prove them—that is, the legal proof of the gun. The law requires it to be fired so many rounds, and if it is not proved, we could not put it in service. There is no estimate about that.

DECK-PIERCING SHELLS.

The CHAIRMAN. The next item is "for steel deck-piercing shells for 12-inch breech-loading mortars, \$163,800." You having nothing to add to that?

Mr. LIVINGSTON. Do you think it is necessary to make that appropriation so large there over your other estimates? We gave you \$30,000 last year, and you estimated only \$78,000, and now you have about doubled it.

General FLAGLER. We estimated for \$78,000 last year and it was reduced. It was necessary that the reduction of last year should be added to what would otherwise have been the estimates for this year or the next fiscal year.

Mr. LIVINGSTON. I asked you why do you have to have it?

General FLAGLER. These deck-piercing shells are for the mortars. The mortars are now in service, and there must be a complement of projectiles for them or the mortars will be useless. I make the complement of projectiles estimated for very low; much less than I am advised by other officers is necessary. The reduction of former estimates leaves us without enough projectiles for the mortars that are in service and that this estimate provides for the service, and the estimate for projectiles is made accordingly.

Mr. BARTLETT. Where are the mortars placed?

General FLAGLER. Sixteen at Sandy Hook, 16 at Grovers Cliff, 16 at East River, and 16 in California, and we will have at the end of this year 48 more in batteries ready for firing.

Mr. BARTLETT. I suppose all you ask for here would only last a few rounds; and suppose a fleet came sailing up New York Harbor, how long would these last?

General FLAGLER. These are very costly projectiles, and we make ourselves at the arsenal cast-iron projectiles, of which we would fire a good many to get the range and for artillery practice. But when the crucial moment arrives we will fire these expensive steel projectiles with a charge of high explosive.

Mr. LIVINGSTON. You have got \$30,000 of projectiles purchased on hand?

General FLAGLER. I believe those are all delivered, inspected, and tested. I think, Colonel, you will remember I urged the necessity of buying these—

Mr. LIVINGSTON. I remember.

General FLAGLER. And I am now putting in an estimate for 12 of these projectiles for each mortar as we make the mortars. It is not a less difficult operation to get the steel projectiles to stand the requirements than it is to get the guns.

The CHAIRMAN. Your theory is it is not worth while to have the mortars unless you have the projectiles, ammunition, etc., provided for them in case of necessity?

General FLAGLER. Yes.

The CHAIRMAN. One is a necessary complement to the other?

General FLAGLER. Yes. I would like to ask the question whether the committee would have any objection to striking out the words "deck-piercing?" These shells are for the 12-inch breech-loading mortars. We have learned something by the Chinese-Japanese war, and we would now like to procure and add to the complement of projectiles for these mortars a few very long, light, and cheaper projectiles for carrying larger charges of high explosives. It has been shown that such projectiles are very effective. They would not be technically deck-piercing projectiles, although they would certainly go through the deck. It is intended, however, that they shall explode in going through.

Mr. LIVINGSTON. You want the words "deck-piercing" stricken out?

Mr. GROUT. Might they not go through the deck?

General FLAGLER. Yes; they will go through the deck; but they would break up in going through.

Mr. GROUT. It is to avoid the question with Comptroller Bowler, I suppose?

General FLAGLER. It is a deck piercing shell, and that is a very fine point to quibble over, but it would fix it exactly by making it "for projectiles for 12-inch breech-loading mortars," that is all. The words "deck-piercing" were simply words we adopted in our office for convenience to enable us to distinguish between "D. P." and "A. P." "A. P." means armor-piercing, and that is a projectile fired from a gun against the side of a ship to pierce the armor.

The CHAIRMAN. Let me suggest when you strike out the words "deck-piercing," you had better include the words "and other shells."

General FLAGLER. I, myself, do not think there is any necessity for changing it, but it would be a little more technically accurate, that is all. If you strike out the words "deck-piercing," that is all that is necessary. As I tell you, it was only a term that was adopted in the office for the convenience of the distinction between the two kinds of shells, "A. P." and "D. P."

The CHAIRMAN. Why not say, "for steel shells, including deck-piercing?"

General FLAGLER. They are steel shells for mortars. It limits them to the mortars.

The CHAIRMAN. Let us put in these words, "for steel deck-piercing and other shells." That will certainly make it comprehensive enough to satisfy the most fastidious.

General FLAGLER. That will include everything, even cast iron.

ARMOR-PIERCING SHOT.

The CHAIRMAN. The next item is "for steel armor-piercing shot for seacoast breech-loading guns."

General FLAGLER. That is prepared in the same way. It is to give us the same number of projectiles for our guns as they are completed and held in store. This will not bring us up to the required complement, but it is to get a limited amount every year, until finally we would arrive at the required complement.

The CHAIRMAN. How many would this purchase?

General FLAGLER. We estimate that the appropriation would get about four hundred and two 8-inch, one hundred and twenty-two 10-inch, and fifty 12-inch.

The CHAIRMAN. That would give how many shots to each gun?

General FLAGLER. We have guns ready to be mounted—that is, guns which have their carriages ready for mounting—and we are now estimating to give 12 steel shells for each of the guns which have carriages ready.

The CHAIRMAN. So this will bring you up to this quantity?

General FLAGLER. Of those which have the carriages provided.

ARMOR PLATES FOR TESTING.

The CHAIRMAN. Go to the top of page 11, "For purchase and erection of armor plates for testing armor-piercing shot." I see your estimates are below the appropriations for 1896. Is their a real necessity for that appropriation?

General FLAGLER. Mr. Chairman, that is an absolute necessity. If we buy the projectiles we must make the tests.

The CHAIRMAN. You have got \$17,300 on hand, and we only gave you \$15,000 the last time; do you want to keep about that much in advance?

General FLAGLER. One reason of having some of that left is we have not tested all the projectiles that the former appropriation allowed for. They have not yet been delivered. I have also changed the method of procuring these plates to reduce their cost. For the last two years we were allowed the amount asked for for the tests, but the appropriation for the projectiles was reduced; so we have bought few projectiles and have not used all the money appropriated for tests.

The CHAIRMAN. You need \$12,700?

General FLAGLER. That is the exact calculation.

Mr. LIVINGSTON. It is on the increased estimate for projectiles; that is the philosophy of it?

General FLAGLER. Yes.

Mr. LIVINGSTON. I supposed that was it.

CHEMIST, EMPLOYMENT OF.

The CHAIRMAN. The next item is, "For the service of chemist in investigating the process of smokeless powders, etc." Have you anything to say in explanation other than you have already given in your report?

General FLAGLER. This is a new item; we have not had any appropriation for that heretofore.

Mr. CANNON. Is it necessary?

General FLAGLER. I regard it as of the highest importance. I would like to make a little statement on that subject if the committee desire it.

Mr. CANNON. It is not big enough to do that, if you have investigated it.

Mr. LIVINGSTON. It is a small amount of money, and if you say it is necessary I do not think we ought to question it.

The CHAIRMAN. Before leaving this matter of the chemist, allow me to inquire whether this is intended as an annual employment or in the nature of a fund for special services.

General FLAGLER. That is to employ a man, and we would probably want to employ him steadily for several years—three or four years, perhaps—when we will get this powder question settled, and we will not need him after that.

The CHAIRMAN. It is intended for compensation for—

General FLAGLER. For one year.

Mr. CANNON. I can see how it is necessary, and you need not go into it.

PROVING GROUND, SANDY HOOK.

General FLAGLER. I would only say, gentlemen, in view of the probable or apparent intention of the committee to enlarge the appropriations, the operations

at Sandy Hook will be very much enlarged, and that estimate was made without contemplating such enlarged operations. I think you will find the estimates have been about \$27,000.

Mr. CANNON. For the last three years, including this, you have had \$22,000, \$20,000, and \$20,000. Now, is \$27,000 enough.

General FLAGLER. I think \$27,000 is our estimate of what will be the cost of running the proving grounds. That includes many expenses of various kinds.

The CHAIRMAN. The next item is the "expense of officers while temporarily employed on ordnance duties at the proving ground, etc."

Mr. LIVINGSTON. I want to ask one question which has never been asked or answered, or, if so, I have forgotten it. When these officers are away from their homes temporarily on duty, are they not allowed, under the regulations, commutation or rations?

General FLAGLER. No; they are allowed nothing. It has been carefully considered a good many times—

Mr. LIVINGSTON. I was asked that question on the floor of the House and I could not answer it, and it may be asked again by somebody.

General FLAGLER. No; they have no commutation.

Mr. GROUT. Those are all officers of the Army?

General FLAGLER. Yes; who have to spend some time there and can not live there.

Mr. GROUT. They do if they are away long enough?

General FLAGLER. No; they never do. Most of these officers go down there and stay about five days. They have to rent house room in New York or else have quarters on Governors Island, and it was necessary to provide some mode of taking care of them, and also taking care of certain boards going there and certain dignitaries, etc., and there had to be a house and it must be maintained. It was a great hardship upon the officers to maintain that themselves out of their small pay. Only a portion of the estimate, however, is for that purpose. A great deal is for draftsmen and other expenses included in it.

The CHAIRMAN. The next item is, "For purchase of ties for repair of railroad track, \$3,000."

Mr. LIVINGSTON. I suppose that is the water railroad we let you buy there?

General FLAGLER. Yes; and the old railroad as well. There are about 10 miles of railroad altogether that we have to take care of, and I suppose you know it would not be best to get costly oak ties, so we get pine ties.

Mr. LIVINGSTON. You know the tie the New York Central purchases altogether for their railroad—the yellow-pine tie. They take a tree before it is tapped and they get the timber with all the turpentine, and I do not think that rots.

Mr. BARTLETT. Would it not be better to get a better tie in the beginning, so as to have it last longer?

General FLAGLER. It might be, but we would not have the facilities, nor would it pay us to go into a system of buying ties in the manner of which the Colonel speaks.

Mr. CANNON. You have 10 miles of road?

Mr. LIVINGSTON. You could buy the oak tie?

General FLAGLER. Yes; but we buy the pine tie and buy it in the market as best we can.

Mr. BARTLETT. Is it yellow or white pine?

General FLAGLER. It is yellow pine, probably; but we use old timbers, also, thrown out from other operations, cut them up, and use anything we can to take care of the railroad.

WATERTOWN ARSENAL.

The CHAIRMAN. The next item is the Watertown Arsenal.

General FLAGLER. At the time the appropriations were made for the carriage factory they were to put in certain new machines and shop fixtures, to erect one additional building, and to extend and alter some others. Congress has provided that amount, but it was stated in those estimates that we must afterwards, from time to time, throw out some of our old or partially worn and old-style machinery which we used when we commenced work, and this estimate is to change some of the old machines and add a few not very expensive new machines.

It is also very necessary that the condition of the plant be improved in other respects. A new battery of boilers is required. The boilers in use now were purchased during the war. We need also increased power. We ought to have electric lights for night work, and we have not power enough to run the dynamo. We would like to have dynamo power enough to operate some of the traveling cranes by electricity which are now operated by hand. It is very important that we have that new engine because that little engine there is one which was put in before the enlargement of this establishment, and is insufficient. It was put in, I think, in 1890. It has only 125 horsepower. We have not power enough, and if anything should happen to that engine we would have to shut down until we could put up a new engine.

Mr. GROUT. Do you put it in as a duplicate or in place of the other?

General FLAGLER. We put in so we can use both or either.

Mr. GROUT. Your purpose is not to remove the old one?

General FLAGLER. No; it is a good engine, one of the very best, but it does not give us sufficient power for running the factory to its full capacity when work is pressed. We also need additional power, as stated, for adding dynamos to the plant for electric lighting, especially in winter, and for adding electric power to the cranes. We would then run both engines when work is pressed and in winter when light is required, and if either engine required repair we would not be left without any power pending such repairs.

Mr. GROUT. What is the name of the officer in charge?

General FLAGLER. Major Riley.

Mr. BARTLETT. You say there should be an electric plant there?

General FLAGLER. For lighting the shop.

Mr. BARTLETT. There is none?

General FLAGLER. There is none.

Mr. GROUT. You do not estimate it?

General FLAGLER. It is to give me the power that I might put in dynamos. We have not the power to run the dynamos now.

Mr. BARTLETT. Would this cover the rest of the plant?

General FLAGLER. No; we will need small sums in the future for further improvements in the plant. You should understand that a portion of this plant is old; machines, tools, and fixtures that were procured before and during the civil war, and economy requires that some of these old fixtures be changed and renewed from time to time.

Mr. GROUT. You would estimate for these some other time?

General FLAGLER. Yes. The great necessity just now is to get the new boiler battery, the new engine, improve the heating fixtures and all—some new fixtures and machines.

Mr. CANNON. I suppose the dynamos in a little while would not cost more than \$3,000 or \$4,000?

General FLAGLER. No.

Mr. BARTLETT. Speaking of electric plants, I met Colonel Corbin who spoke to me the other day, representing the general commanding, and he says they should have an electric plant on Governors Island for the purpose of safety in time of danger. Do you know anything about that on Governors Island?

General FLAGLER. I know Governors Island very well.

Mr. BARTLETT. Do you know there is no electric plant there?

General FLAGLER. That would be under the quartermaster's department and I have nothing to do with that.

The CHAIRMAN. Pass to the next item, "for rebuilding and enlarging the arsenal wharf upon the Charles River, \$12,500." That seems to be explained, but have you anything to add to that?

General FLAGLER. The wharf was built, I think, about seventy-five years ago. It has had slight repairs from time to time and has been kept in sufficiently good condition for handling the light weights that have been received and shipped from time to time. It is now in very bad condition and will not support the crane which is required for handling heavy gun carriages. It has a dry wall, which is in danger of falling into the river. The stone in the wall is excellent granite, which could be utilized in building a new wall. The whole repairs would probably make the wharf secure and save the cost of countless small repairs for fifty or one hundred years. The wharf is economical, because it enables us to ship the large seacoast carriages by water transportation, often directly to the fortifications. It will probably be an absolute necessity for the shipment of the 12-inch disappearing carriages, as I think some parts of these carriages can not be shipped by rail. They will not pass through the railway tunnels and under bridges. It has been necessary with some of the smaller carriages to construct a special car for this purpose. A longitudinal hole has been cut through the platform of the car for standing the base rings up on edge and lowering them to permit their passage through tunnels and under bridges.

Mr. GROUT. And then it was subject to extra charge?

General FLAGLER. Yes. As stated, the important considerations are to have a good wharf to save future repairs, to make the wharf strong enough to support the required crane for loading heavy carriages, to provide for the shipment of such large parts as could not be shipped by rail, and to make the great saving in the cost of transportation that can be effected by shipping by water directly to the fortifications. The saving will be very great in some cases. Railroads do not generally approach very near the fortifications, and shipments by rail necessitate a long haul over difficult country, or require a transshipment by water to the fortifications. These transshipments are generally very expensive, because private wharves which must be employed or hired have not usually such powerful cranes as are required for

handling these carriages. Also, suitable lighters or boats for the transshipment are not always at hand.

Mr. GROUT. That is the wharf at the Watertown Arsenal?

General FLAGLER. Yes; it is a part of the arsenal. If we once get a good wall there it will stand, practically, forever. It will be like a good dock.

WATERVLIET ARSENAL.

The CHAIRMAN. Now come to the item of the Watervliet Arsenal, on page 14.

Mr. LIVINGSTON. You want to stop the well-bucket business and get pure water by piping; that is it?

General FLAGLER. Yes; the note explains that.

BENICIA ARSENAL.

In regard to the item for the Benicia Arsenal, California, it has become necessary for the following reasons: We are now procuring the powders which will be used on the Pacific Coast from manufacturers on that coast. The Pacific Coast powder companies have kept pace with the Eastern, and in some respects have exceeded them. This is important, for it saves the cost of having our powder transported across the continent by rail. You can see the necessity that we should get these powders on that coast. If we get them there it is difficult and almost impracticable to have the tests of the powders made here in the East. The estimate is to provide a small proving ground for testing the powders at the Benicia Arsenal. Firing butts are required, platforms for mounting the carriages, and other provisions.

Mr. LIVINGSTON. Do you consider it an economy to do this?

General FLAGLER. A very great economy. We have tried to test some of the powders by the batteries there, but it is nearly impossible, as we can not make the firings.

RAPID-FIRE GUNS.

The CHAIRMAN. Now, General, respecting this supplemental estimate of \$150,000 for armament of fortifications, transmitted by the Acting Secretary under date of January 16, 1896, and relating to rapid-firing guns, which brings us to the question of rapid-firing guns, the committee will be pleased to hear from you on that subject.

General FLAGLER. I think the committee will want very little in addition to what is stated in that report. We have known for the last six years we must have rapid fire guns in connection with our seacoast fortifications. Their use is first for flank defense, that is to defend the fortification from attack by land force or from boats, or a sudden rush of any kind. We must be able to answer by rapid-firing guns the secondary batteries aboard ships and quell their fire, the object of which is to destroy the accuracy of the firing of our great guns, to drive the men from the guns. We must be able to reply to that fire.

The CHAIRMAN. That is directed to our mortars and not to our guns equipped with the disappearing carriage?

General FLAGLER. There is also the very great importance of protecting our mine fields from the torpedo destroyers. The engineers still propose at certain points to use our old smooth-bore guns, which are already in position, to protect these mine fields, and for economy's sake these guns will be used where they are in position, but they are inferior guns and not well suited for the purpose. Where new guns are required all rapid-fire guns will be employed. The value of the rapid-fire guns consist not only in their effectiveness, but in the small cost of protecting by fortifications these small guns compared with protecting the old-pattern guns; many of the old-pattern guns are of no use, except for protecting mine fields, whereas the rapid-fire gun is required, as stated, for the protection of fortifications and for answering fire of the secondary batteries of troops.

These rapid-fire guns have become an important and very valuable part of the armaments of foreign nations. We were not able to take up the subject of their manufacture until about three years ago. Since my annual estimates were prepared the tests of the types of these guns have been so far completed as to enable us to select the type, and we are now prepared to furnish them. The plans of the Engineer Department require a few of these guns at once, and the matter was of such importance that I deemed it necessary to submit an estimate for a few of them at once, without waiting for the estimate for the ensuing year.

Mr. CANNON. You have none now?

General FLAGLER. No.

Mr. BARTLETT. What kind are determined upon?

General FLAGLER. I would not like to state that, because of the question of the payment of royalties upon them.

Mr. BARTLETT. Those are light guns?

General FLAGLER. The 6-pounder is a light one.

Mr. BARTLETT. Do they fire with a crank?

General FLAGLER. No; these are cannon.

Mr. BARTLETT. Why do you call them rapid-fire instead of the others; can not the others be fired as rapidly?

General FLAGLER. You mean the other breech-loading field guns?

Mr. BARTLETT. Are not all the new guns rapid-fire guns except the very large ones?

General FLAGLER. No. The difference between the rapid-fire guns and our other field and siege guns is that the field and siege guns must necessarily be mounted on what is called a traveling or wagon carriage, which provides for traveling across country, movement with armies, and on the battlefield. For all such guns the carriage itself recoils when the gun is fired.

Mr. BARTLETT. Certainly.

General FLAGLER. To fire the gun again it must be run back into battery by hand and pointed, which consumes time. The rapid-fire gun is very different. It is designed for stationary positions, and can not travel across the country. In firing, the carriage does not recoil. The carriage, or mount, is stationary, and some means for a slight recoil of the gun on the carriage is provided, and provisions also made for an automatic return of the carriage to its firing position. This provision is usually a spring, called a "spring return." During the past few years efforts have been made abroad to provide a rapid-fire gun for field carriages (that is, the traveling carriages which I have described), but without good success. The problem is to provide some satisfactory means of anchoring the traveling carriage so that it will not move when the gun is fired, and then to provide for some recoil and automatic return of the gun to its firing position on the carriage.

Mr. LIVINGSTON. I want to ask you about our need of defense on the lakes, especially around Buffalo?

General FLAGLER. You should ask General Craighill that question.

Mr. LIVINGSTON. I forgot it.

General FLAGLER. I know the very great importance of having our lake ports defended, but the plans for the defense are made by the engineers and I furnish the armament.

Mr. BARTLETT. You appeared before the Senate subcommittee in reference to the Squire bill?

General FLAGLER. Yes.

Mr. BARTLETT. That bill appropriates \$87,000,000. Are any of the items which will be covered by this ordinary appropriation bill a part of those estimates?

General FLAGLER. They are all a part of that \$87,000,000.

Mr. BARTLETT. I mean to say, suppose we appropriate \$7,000,000 or \$8,000,000, or whatever it may be under this regular appropriation bill, is that the same as the first appropriation of \$8,000,000 here?

General FLAGLER. It would constitute a part of the estimate for our complete coast defense; it is a part of the estimate on that theory.

Mr. BARTLETT. Suppose we give all that is asked for in this bill, would there be any other items in his bill which are not covered in these items?

Mr. GROUT. For instance, suppose there is only \$7,414,000 asked for here and he provided \$87,000,000 in annual expenditures?

Mr. BARTLETT. And his first appropriation is \$8,000,000.

The CHAIRMAN. It is intended to cover substantially the same. Now, a few general questions. What, in your judgment, is the relative efficiency of guns on lands and on shipboard? In other words, a gun on land is equivalent to how many guns of a like capacity on board a ship for effectiveness. I have seen the estimate that a gun on land is equal in efficiency to five of such guns on board of a ship. Is that estimate substantially accurate?

General FLAGLER. I would put that relative value that you speak of there as about three.

The CHAIRMAN. About three to one?

General FLAGLER. Yes. It is a difficult question to answer without explanation. A gun on a ship can do two things. It can be employed in defense purely, but its object generally is what is called offensive defense. It can go and attack an enemy, but the gun on land can not do that. The reason the gun on land is more powerful in the way of defense than it is on the ship is that it has greater security and greater accuracy of fire, and the ability to have bigger and better guns. It has a stable platform, and the firing is much more accurate. We are not limited in any way in regard to the length of gun, weight, kind of gun, or carriage, and so on. All of these are limited by the requirements of the ship.

It may not be practicable, judicious, or wise for carrying on board ship a gun of the magnitude and caliber that is desired. It may not be practicable to provide accommodation for it. The facilities for furnishing protection for the gun are limited. The carriage must be one that can be operated when the vessel is pitching and rolling.

These requirements limit and hamper the effectiveness of the gun aboard ship. If we compare the effectiveness of the ship with the land battery exclusively as a means of coast defense, then we must consider the value of the ship as a fortification. It would have some advantages in being a movable fortification, but it is an exceedingly expensive fortification. If we take this expense into account, and confine ourselves exclusively to the value of the guns in the land defense and on board ship, for the defense of a harbor, take into the account the relative value and cost both of the land battery and the ship, I think the relative value in dollars and cents would be much greater than five to one in favor of the fortification gun.

In my judgment, however, this is not the proper way to look at the matter. The land or coast defenses and a fleet should operate in conjunction for the defense of our harbors. It would not be wise to have no fleets and thereby permit the enemy at his leisure and without interference to combine all his fleets to operate against one point, and having failed or succeeded in his operations there to move all his fleets without interference to another point. The land defenses do furnish much the cheapest, best, and an absolutely necessary means of closing our harbors against the enemies' fleets and of keeping them out. They furnish also, and this is of the utmost importance, a safe refuge for our own fleets, from which our fleets can operate upon the enemy, prevent combinations, get out and destroy vessels, and to which our fleets can repair from time to time to refit, coal, prepare new combinations, etc.

The CHAIRMAN. Now, in that connection, what is the relative cost of producing the same degree of efficiency on land by coast defense and of making a like defense by means of the Navy and taking into consideration in that connection the guns used on land and on water? You get my idea?

General FLAGLER. Yes. I have not made the calculation. I should say your question means this: Suppose we had to defend New York Harbor, what would be the relative cost of defending it with ships or land defense—

The CHAIRMAN. To produce the same degree of efficiency?

Mr. CANNON. One to five, somebody says.

General FLAGLER. That is different. I should think the difference would be very much greater than that in dollars and cents. After the land defense is once provided you have little or no expense for care and preservation, whereas, the ship requires not less, I believe, than 20 per cent per annum of first cost for care and preservation and to this you must add a much greater amount for the expense of personnel, operating, coal, etc.

Mr. BARTLETT. You do not agree with General Proctor that we can let the Navy lie in peace without any increase?

General FLAGLER. I think not. I think—

Mr. GROUT. He is simply urging the relative importance of the land defense.

Mr. BARTLETT. He made a distinct argument in favor of not doing so much for the Navy.

Mr. GROUT. Relatively.

General FLAGLER. I think he is right on that point.

Mr. BARTLETT. His argument is intended to discourage the enlargement of the Navy.

General FLAGLER. I should think the importance of a Navy is well established. There is no question about it.

Mr. BARTLETT. I do not want to exaggerate the views of any gentleman from Vermont—

Mr. GROUT. I may not have the right apprehension of it, but I understand his argument to be that more was being done for the Navy than the coast defense; that our attention now should be given to coast defense, and that the Navy was well ahead of the coast defense in regard to the two methods of defense, and, perhaps, while it should not be absolutely stopped, he would have the coast defense go faster than the Navy. He does not really recommend that there should be nothing more done on the Navy, does he, Mr. Bartlett?

Mr. BARTLETT. I read a report of his speech in the Tribune, and it seems that one or two of the New York papers took up that view.

General FLAGLER. There is one more point I would like to touch upon on this subject, as I deem it of importance, in regard to the relative value of fleets and land batteries for coast defense. It is this: One of the inherent qualities of a ship is a certain kind of frailty. The ship can be destroyed by fire and many other means; the land battery can not be so destroyed. One lucky shot, one shot which is not even lucky, from one of our largest guns, one successful explosion from a submarine mine, or a torpedo, may destroy the most powerful vessel, with all its personnel, armament, and costly supplies. The land fortification and its armament is in comparison impregnable, and can not be so destroyed. We are all familiar with the result of the frings against Fort Sumter. After what was regarded as a destructive bombardment of two years, the fort was as effective, perhaps more effective, against an enemy's fleet than before it was fired upon. The same thing was also well illustrated in the bombardment of Alexandria by the English fleet. Taking this into

account, and also the relative first cost of vessels and fortifications and the relative cost of maintenance, it seems to me the relative value of a gun in the land defense and a gun aboard ship simply for keeping fleets out of our harbors might be placed at almost any figure you please; but this does not militate against the absolute necessity of having fleets.

The ship may be destroyed; the land battery can not be so destroyed. A sufficient preponderance of fire from a powerful fleet might silence a battery, but unless the enemy land and take possession of the battery, the battery would generally be ready to reopen fire in a few hours.

Mr. CANNON. You could not, however, run 10 miles in the ocean and fight?

General FLAGLER. No. The two kinds of defense should go together.

The CHAIRMAN. The two are a complement of each other?

General FLAGLER. Yes, sir; as much as the cavalry and infantry of an army. The Navy is the cavalry of the Army and we are the solid fighting fellows.

The CHAIRMAN. Have you anything else to suggest, General?

WATERVLIET ARSENAL.

General FLAGLER. I am a little sorry to have to ask for one more matter. When I made a statement to you yesterday about the necessity for the additional appropriations I said nothing on one point, and under the authority you gave me to prepare these items I did not feel I was authorized to put it in because I did not state anything about it. It is an item of importance for the gun factory at Watervliet. It is not in your bill, but it is "for filling and grading grounds, construction of necessary roads to shops, and to cover the same with granite paving, \$3,500."

This is necessary for the construction of some very necessary roads at the gun factory. When the plans for the gun factory were adopted, they were grafted on to the old arsenal that had some small, poor roads running in certain directions which accommodated this old arsenal. When we located the gun factory, it became necessary to relocate these roads and make them bigger and better. We have done a good deal of work on them. Some are completed; more are graded and not paved. These are in very bad condition. The work has been as economically managed as was possible, employing enlisted men for the labor, and it is estimated that \$3,500 will enable us to complete them. The soil and climate are such as to require that the roads which are used for heavy hauling should be covered with granite pavement.

The CHAIRMAN. To bring the matter properly before the committee, amend my request so as to cover that point.

General FLAGLER. I will put it in the additional estimate.

Mr. BARTLETT. Suppose we make the full appropriation asked for by you and by the Secretary of War for fortifications, will that cover all of the initial appropriation asked for in the Squire bill in the first year?

General FLAGLER. I do not know what you mean by "the initial?"

Mr. BARTLETT. He asks for the remainder of this fiscal year \$1,500,000, and for the next year, ending June 30, 1897, \$5,500,000. Are these separate and distinct items from these here, or are they the same? He asks \$87,000,000, and he divided it up in this way: for the fiscal year ending June 30, 1896, \$1,500,000; for the fiscal year ending June 30, 1897, \$5,500,000, and for each fiscal year thereafter, \$8,000,000. If we appropriate all that is asked for in this regular appropriation bill, does that substantially cover the first outlay that the Squire bill asks for?

General FLAGLER. I should think the answer to your question would be, yes; that you will now provide what I told him when he commenced on that bill we would want to use next year.

Mr. BARTLETT. If we pass this appropriation we practically do all that we can do, then, this year?

General FLAGLER. No, we do all in the next year we can do running eight hours a day economically and carefully. There are many items, especially powder, ammunition, and many others, which would be required in large quantities, if an emergency should arise.

Mr. BARTLETT. If we had war I suppose we would have to have new legislation anyway.

STATEMENT OF MAJ. GEN. NELSON A. MILES, COMMANDING THE ARMY.

THURSDAY, March 5, 1896.

The CHAIRMAN. Gentlemen of the committee, General Miles is present at our invitation, and we will now be pleased to hear from him. General Miles, as you know, we have under consideration the general appropriation bill for fortifications, and we

will be pleased to hear from you respecting any matter contained in the bill, and also on the general subject of fortifications, upon which the committee specially desires all possible information.

General MILES. Well, the estimate of the Board of Ordnance and Fortification is given in the report on page 21. The first item there is for the construction of a 12-inch disappearing gun carriage and to test the same with 50 rounds of ammunition, also to test experimental gun carriages with the new experimental ordnance material. Those first three items were included at the urgent request of the Chief of Ordnance in order that they may thoroughly test the 12-inch disappearing carriage. So far with the 8 and 10 inch, the result has been satisfactory. It being made the duty of the Board of Ordnance and Fortification to test all the appliances and to adopt a type by which the Department can be governed in the ordering of guns, carriages, and mortars, it is necessary to have a special appropriation for that purpose. That has been the system since the ordnance and fortification board was established by act of Congress.

The CHAIRMAN. The appropriation for 1896 was \$100,000, and the estimate for 1897 seems to be the same as the appropriation. I believe there are no changes in that item?

General MILES. The estimate of the Board of Ordnance and Fortification was \$245,000.50.

The CHAIRMAN. The estimate submitted by the War Department to Congress is \$100,000.

General MILES. Possibly the explanation is this: \$100,000 has been appropriated for the last two years, but the Board had a fund in excess of this amount. The permanent and previous liberal appropriations having been drawn upon and used they estimate in this year this amount would be required in order to make tests required by the Department. Congress appropriates a certain amount for heavy guns, carriages, and for rapid-fire guns. At present there has been none adopted for the 12-inch disappearing carriage or rapid guns, and for that reason they ask a larger appropriation this year.

Mr. CANNON. But they do not ask it?

General MILES. Possibly the Secretary of War may have cut down the estimate.

The CHAIRMAN. Allow me to ask; the estimates, as set out in the report of the Board, I see include, for instance, for the construction of a 12-inch gun carriage, \$45,000. Now, is not that included in the estimate of the Ordnance Department under General Flagler which comes in in another part of the bill? Now, I see in the Book of Estimates, page 199, that the estimate reported to Congress by the Secretary of War is \$100,000 for this item, just the amount which is before you in the bill, and I apprehend that fact may possibly account for the apparent discrepancy in the figures. In other words, that this estimate made for the expenditure of the Board of Ordnance and Fortification simply relates to matters of their expense and not to work of construction, which may be included in the estimate for the Engineering Department or for the Department of Ordnance?

Mr. CANNON. And along on that, to verify, somewhere along this hearing when we had the Chief of Ordnance, you recollect he spoke of the 16-inch gun, and he wanted \$115,000 to buy forgings for that gun which is a type gun, so that they may have scattered them through here. I do not know what the fact is.

General MILES. I am not aware of that.

The CHAIRMAN. Now, in respect to the \$45,000 item for the disappearing gun carriage, I am sure, from the careful watch we found exercised by various branches of the War Department, it will not be found that there is any discrepancy between the aggregate figures and the figures submitted by each particular branch of it?

General MILES. I do not think this item could have been in the estimate of the Chief of Ordnance, because that is submitted in a letter by the Chief of Ordnance addressed to the Board of Ordnance and Fortification, in which he specially asks that this sum might be secured in order that these tests might be made, because I understand you appropriate money for the purchase and construction of material, but not for the testing and for the determining of the type of guns. That was the reason, I understand, why the Board of Ordnance and Fortification was created.

The CHAIRMAN. Do you understand, for instance, the Board of Ordnance and Fortification, out of their appropriation pay, for instance, for the construction of this disappearing carriage?

General MILES. That is what they do. For instance, a model or suggestion is made as to the best gun or carriage and they have to authorize its construction. They have heretofore tested it and then determined as to its value. There is no question as to a piece of ordnance that has already been adopted and found to be desirable; it is a question of determining the best guns, carriages, and mortars and adopting a type in order that the Ordnance Department and the Secretary of War may act intelligently as to the expenditure of money which you appropriate for the construction of them. The Secretary of War does not pretend to say what kind of a type shall

be adopted or what gun shall be adopted and neither does the Chief of Ordnance. That has practically been fixed by an act of Congress.

Mr. CANNON. That is the Ordnance and Fortification Board?

General MILES. It is the creation of Congress for a specific purpose.

Mr. BARTLETT. I would like to ask if it is certain that the 16-inch gun ought to be made?

General MILES. That is the impression. There are certain places where that gun would be most valuable; for instance, at the entrance of the Golden Gate, and there are a few places where that gun would be superior to any other gun, but there are only a few places where a gun of that caliber would be used.

Mr. BARTLETT. We ought to have a few, I suppose; four or five?

General MILES. If Congress chooses to do that we have lathes at Watervliet Arsenal, but we have never made them. The experience in European countries is that that is too large a caliber for ships. The 13-inch gun is now regarded as the largest caliber available or desirable to be put on board a vessel. The Italian Government has guns even larger than the 16-inch, but the general opinion is that is too large. There are certain places where they can be placed on solid rock or concrete foundation and used with efficiency.

Mr. CANNON (to the chairman). I suggest that the question of whether the material is appropriated elsewhere would appear on the examination of the notes; or do you wish to ask further here?

The CHAIRMAN. No; I do not care to do that. Has this Board of Ordnance and Fortification any balances of previous appropriations unexpended; and if so, what is the amount?

General MILES. Captain Ayres can give you the item.

Captain AYRES. It is \$144,621.43. That is to last to the end of this fiscal year, but of this sum \$24,775 is available only for movable submarine torpedoes, and the sum of \$4,500 is available for the manufacture of 8, 10, and 12 inch guns for the seacoast, given to private parties, which renders it practically unavailable for allotment. That reduces the amount to about \$116,000 at the date of this report, which was October 31. Since then considerable money has been expended and allotted, and this will have to last until the end of this fiscal year.

The CHAIRMAN. Does that include the appropriation for 1896?

Captain AYRES. Yes, sir; we include 1896.

The CHAIRMAN. At the end of the fiscal year what do you estimate will be the unexpended balance remaining?

Captain AYRES. Well, that is pretty hard to tell. The allotments are made every month, and it is very difficult to say what it will be, but it is supposed it will all be paid out by that time.

General MILES. I think it will be entirely exhausted.

Captain AYRES. There will be some pretty large sums coming out of that; for instance, about \$30,000 will have to come out of that for the 10-inch center pintal carriage which has been asked for, and that will make quite a hole in that amount.

The CHAIRMAN. What proportion of this estimate, in the event it should be fully appropriated, would be expended by March 4, 1897?

General MILES. That can be done entirely according to the wish of Congress in the matter; probably a reasonable proportion of it. I do not think all of it.

The CHAIRMAN. In other words, the expenditures of the Board of Ordnance and Fortification are fairly proportionate to the time?

General MILES. Yes, sir. To illustrate, there are four different methods for a disappearing carriage, and the Board has adopted one, and there are still other improvements, and the purpose of it is to select the best and to discard those which are of the least value. The Board is constantly receiving propositions of inventors or supposed inventors, and the principal work is to get the chaff separated from the wheat. Where a gun or carriage or appliance of war is presented to the Board and it appears to have merit, they are very slow about their investigations, as they have to be very careful about it; and if they think a new invention has merit and are satisfied of it, then they endeavor to have one constructed at the least possible expense and tested; and if it is found to be a valuable improvement on what has been tried heretofore, then it is adopted as a type and recommended to the Department for general use, so that the expenditures under that head would probably last the whole year; that is, they will be available during that entire year. The amount expended last year was \$115,284.

The CHAIRMAN. I suppose that is the only item in the bill which comes under your special jurisdiction?

General MILES. Yes, sir.

The CHAIRMAN. Have you any considerations relating to the general subject of fortifications which would be of interest to the committee and would assist them in the preparation of this bill? And if so, we will be very much pleased to hear from you.

General MILES. There is one item to which it might be well to invite your attention. If you notice in the report of the Honorable Secretary of War, page 21, he says that by next July there will be completed so many guns—twenty-nine 12-inch, forty-five 10-inch, and sixty-three 8-inch. That will give you by next July 137 modern guns. On the same line you will notice the number of carriages—there are ten 12-inch, thirty-one 10-inch, and fourteen 8-inch. Therefore, next July you will only have 55 carriages to mount your 137 guns. Further along on the same line you will find three emplacements will be for three 12-inch, sixteen 10-inch, and five 8 inch. Therefore, next July you will have 113 guns which you can not mount. Guns without carriages are useless; guns with carriages and without emplacements are useless, and if you will notice the report of the Chief of Ordnance of last year you will find they will have, when the contracts are filled, 8 rounds of ammunition for the 8-inch guns, 11 rounds for the 10-inch guns, and 13 rounds for the 12-inch; and therefore guns, carriages, and mountings without ammunition would be useless. I would invite your attention to this and suggest, if possible, the appropriation be made in such a way that when a gun is completed there should be a carriage to place it upon, and a platform to mount it upon, and ammunition to use, and then you will have at least a gun that will be available.

The CHAIRMAN. Will you please explain to the committee what is meant by the term "emplacements."

General MILES. That consists of the parapet in front of it to protect the men from the enemy's fire, and also to protect them from the blast or the gun. The gun must be placed over a solid foundation rather than in the rear of it, because the blast of the gun would destroy anyone in the pit. Then the term "emplacement" also includes the platform and appliances for the placing the carriage upon the platform.

The CHAIRMAN. It means, practically, the erection and support of the gun?

General MILES. Yes, sir; and the magazine is also included in the emplacement, usually.

The CHAIRMAN. And it is usually made of masonry?

General MILES. Yes, sir; but I am not sure but a very great saving could be made in that respect. For instance, the emplacement of an ordinary gun costs about \$50,000. That amount of money would buy 3,333 tons of steel; that is, if you take steel rails that are no longer of use for railroad purposes, which they sell for three-fourths of a cent a pound, and whether they could be placed in such a way as to take up the blast of the gun and protect the men behind it or not, is a matter that can be easily determined. It is a subject which has attracted my attention, and I propose to further consider it. My impression is, a very large amount of money can be saved in the emplacements. In case of emergency we would simply seize and tear up the first railroad we could find, and get steel rails to put around the gun, and then we might possibly mount 55 guns, for we will have only 55 carriages by next July. In case of an emergency, some measure of that kind would have to be adopted. The adoption of such appliances was what brought out the strong defense of Fort Sumter.

They put palmetto logs, cotton bales, and material of that kind to protect the men and guns in the fort, but my impression is that whatever appropriations are made, and in what way they are made, instead of having guns on skids, as they are now, utterly useless when the gun is completed, there should be a carriage and emplacement ready to place it upon so that it would be in working order. You will also notice in the same report of the Honorable Secretary of War that but three modern guns were mounted at the time the report was made; also one each at Fort Monroe and West Point, for instructions. They are a part of the guns you have authorized, bought, and paid for, and the others rest on skids.

The CHAIRMAN. Now, this appropriation here which is under consideration makes relatively the proper appropriation. It is based upon the estimate which made proper proportions between gun, carriage, emplacements, and other matters which are to be considered to properly equip the service?

General MILES. I do not know.

Mr. LIVINGSTON. It is supposed to be from the fact that the Chief of Ordnance made it.

The CHAIRMAN. These estimates come to us from the Department?

General MILES. The estimates have been made by the different Bureaus, and Congress has authorized this and authorized that; but that is the result to-day of the appropriations that have been made heretofore—that is, by next July you will only be able to mount 24 guns and you will have 115 of no more value for active war than so much railroad iron.

Mr. HEMENWAY. Why, then, have they not recommended or made estimates here that these things may be equaled up and let us have a proper amount of carriages, guns, and emplacements?

General MILES. That is a matter I have nothing whatever to do with, and I could not answer your question.

Mr. HEMENWAY. Would it not be a good idea for you to suggest to the proper parties that they should send in estimates here to regulate this matter?

General MILES. I have simply made this suggestion: That you should provide by act of Congress that the appropriations be made in such a way that next July or a year from next July you will be able to mount at least all the guns you pay for.

The CHAIRMAN. Let me ask you to carefully examine this bill and communicate with the committee touching any disproportion in the estimates which may occur to you; or if you conclude they are proportioned, will you advise us of the matter?

General MILES. You need not take my suggestions. If you will simply examine the report of the Secretary of War, on the twentieth page he says that at the rate the appropriations are being made it will take twenty years to make the guns required and seventy years to make the emplacements; and on the next page, if you choose to add it up, you will see just where you are; that is, that you have got a lot of guns that you can not mount, and the Chief of Ordnance's report will show that if you had them all mounted you would have only about eleven rounds of ammunition per gun. According to these reports, you will have next July 137 high-power guns and only 55 carriages; if you were to order the carriages and emplacements in order to render them complete it would cost, I estimate, \$3,000,000, and to place behind them sufficient ammunition to make them effective would cost, including ammunition for the 84 mortars, \$7,000,000 in addition.

Mr. BARTLETT. Are these appropriations over and above what are already made in this bill?

General MILES. These are not appropriations. I am speaking of high-power guns purchased or ordered during the last five years.

Mr. BARTLETT. Is there any appropriation to cover that in this bill?

General MILES. I have not examined the appropriation bill, and I do not pass judgment upon it; but I simply take the annual official reports as they have been published.

Mr. BARTLETT. What I was going to ask you principally was, we want to know where we stand, and if we have 113 unmounted guns it is a ridiculous thing and ought to be remedied.

General MILES. It is a fact. We had only three mounted at that time, with the exception of one each at the West Point and Artillery School.

Mr. BARTLETT. Does this bill provide for it?

General MILES. I can not inform you.

Mr. BARTLETT. Would you be willing to examine the bill and tell us?

General MILES. I would rather it would be referred to me through the proper authority, the Secretary of War. I have called your attention to the condition of affairs as stated in his report and my own.

Mr. BARTLETT. I think it ought to be remedied as it is a ridiculous condition of affairs, it seems to me.

General MILES. It may not have occurred to you that in order to place these guns already paid for, or that will be ready next July, and that probably will cost \$5,000,000, it will cost near \$10,000,000 to render them efficient and ready for war purposes.

Mr. BARTLETT. And they can not be utilized?

General MILES. You can utilize 24 of them, as you will be able to mount that number.

Mr. CANNON. What do you say as to the possibility of keeping the Ordnance Bureau twelve months ahead of the Engineer Bureau?

General MILES. Judging from past results the Ordnance will be fifty years ahead on guns, thirty years ahead on carriages, and an indefinite time behind on ammunition. If I were going to fit out a wagon train I would want the wheels and everything complete at one time in order to move that train when paid for, and the same way with a railroad train.

Mr. CANNON. But if it took a month to make a wheel and three years to make the balance?

General MILES. I would have them all completed at the same time, and if I wanted to move a railroad train I would not want a hundred locomotives without cars or cars without the locomotives. You will notice the amount is stated here at 137 guns, 55 mortars, and 24 emplacements, and that says nothing of the ammunition to be used, and the guns, of course, are good for nothing unless you have ammunition.

The CHAIRMAN. The principal suggestion you make is that there is no necessity of making any further appropriation at this time for guns, but that the limited appropriations which we are able to make should be directed to bringing up the quota of carriages and emplacements?

General MILES. I do not wish to be understood that I do not think it is necessary to make further appropriations for guns. I do think it is necessary for the safety of the Government and the country there should be very large appropriations; but whatever appropriations, in my judgment, are made, be they large or small, they should

be made in such a way that when a gun is constructed it would be ready in all its requirements for action.

The CHAIRMAN. In other words, our appropriations should be first directed to bringing up the quota of carriages and emplacements?

General MILES. Certainly; it seems to me that should be the first consideration.

The CHAIRMAN. And to bring up our quota of carriages and emplacements to our quota of guns the amount now required of appropriation will be about \$10,000,000?

General MILES. To put the guns and mortars upon the carriages and emplacements would cost about \$3,000,000, and the ammunition that should be behind them ready for war purposes would cost at least \$7,000,000.

The CHAIRMAN. In other words, the first \$10,000,000 we appropriate should be expended in providing the necessary carriages, emplacements, and ammunition, including projectiles?

General MILES. If you want to utilize the guns you have already paid for.

The CHAIRMAN. And in your judgment such a course should be adopted?

General MILES. I think that would be a judicious, businesslike proceeding.

Mr. BARTLETT. Is it necessary to spend as much as \$7,000,000 on ammunition?

General MILES. Quite as much.

Mr. BARTLETT. At once, so as to be prepared?

General MILES. If you want to have 100 rounds behind each gun.

Mr. BARTLETT. And that would be a very small allowance?

General MILES. A very small allowance; but if you will notice the report of the Chief of Ordnance this year, he states that if the contracts are completed they will have 8 rounds for a certain class of guns, 11 rounds for another class of guns, and, I think, 13 rounds for another.

Mr. BARTLETT. What I would like to know, Mr. Chairman, is whether from your examination of the bill any part of the \$3,000,000 necessary for carriages and emplacements is already provided for in this bill?

The CHAIRMAN. Oh, yes.

Mr. HEMENWAY. Is this ammunition to be had readily in case of emergency?

General MILES. No, sir. It takes from three to six months to construct the ammunition, but only a very limited amount can be constructed with the present plants in this country. Items of that kind—for instance, ammunition and gun carriages—could be constructed by contract, but it takes nearly a year to make a gun carriage and from three to six months to make the armor-piercing projectiles, and it takes about six months to make the emplacements for heavy guns.

Mr. CANNON. Have you progressed far enough in your Board or has the Department progressed far enough to say that they are prepared to recommend a provision of ammunition and shells? I mean now to cover the whole ground which you have been talking about.

General MILES. They have progressed far enough to adopt what they believe to be the best gun, carriages, and kind of ammunition suitable for the purpose as far as they have gone.

Mr. CANNON. I want to know whether it is good policy in the present condition of the preparation of ammunition, shells, and all that includes, to expend \$7,000,000 on ammunition? In other words, have you progressed far enough so that, say, in twelve months one-half of that expenditure would not be obsolete?

General MILES. We know that we have as good ammunition as the inventive genius of man has been able to construct so far in any part of the world, and that it can be manufactured in reasonable quantities. You could not make that in any great quantity because the methods are secret to some extent, but you could in any reasonable quantities.

Mr. CANNON. What is the expensive part, the powder or shell?

General MILES. It is the shell, and the armor-piercing projectile.

Mr. CANNON. That enables me to ask a question which will probably illustrate what is running in my mind. The Carpenter shell, twelve months ago, from my standpoint, and what little I know about it, was supposed to be the best shell made, whereas I have seen it claimed within the last month the Carpenter shell was quite antiquated, and some other superior shell which throws it away in the shade has been produced?

General MILES. There are always reports of that kind about some powerful engine, or some great power that can destroy armies and sink fleets; many improvements are being made. There are many improvements in armor and armor-piercing projectiles.

Mr. CANNON. This shell I speak of, according to the newspaper accounts, was tested somewhere, down the Potomac, possibly?

General MILES. I presume you refer to the cast-iron shell with a steel point.

Mr. CANNON. I think the reading of the newspapers says that the Carpenter shell was not of much account as compared with it.

General MILES. The Army uses a different shell from the Carpenter shell, which has been found to be very effective and equal to any kind that has been manufactured so far.

The CHAIRMAN. Bearing on that point, take the case of New York Harbor. Suppose an invading fleet was approaching that harbor. Now, eliminating from the question the shot that might be fired by one of our guns there to get the proper range, for which any kind of shot would answer, how many of these modern projectiles would one of these guns, in all reasonable probability, fire at a ship while she was approaching, passing, and after she passed? Do you believe it would fire as many as a half a dozen?

General MILES. It certainly ought to fire many more.

Mr. CANNON. There would be some fired to locate the range?

General MILES. Certainly.

The CHAIRMAN. Aside from locating the range?

Captain AYRES. They can fire ten shots in about fifteen minutes. The range is given by range finders, and you get that almost exactly without any firing of shots.

General MILES. They have fired 33 rounds per hour and also at the rate of 40 rounds in sixty minutes with these modern 10 and 8 inch guns.

The CHAIRMAN. Evidently there is a considerable variety of opinion of the quantity of ammunition to be used under the circumstances I have suggested, which, of course, is a practical illustration.

General MILES. The range of modern guns is about 12 miles. Suppose they open fire when a fleet is within 10 miles and they continue it until it is 5 miles beyond the fortification; that leaves your fleet under fire for 15 miles, and they certainly ought to fire a great many shots in that time.

The CHAIRMAN. In your judgment would shots be fired at that distance of 12 miles?

General MILES. I think it would be certain they would open fire perhaps at 8 and 10 miles, but probably not at the extreme distance of 12 miles.

The CHAIRMAN. That is, for the purpose of doing effective execution?

General MILES. Yes.

The CHAIRMAN. Now, then, with respect to the ammunition for these field and siege guns—

General MILES. Excuse me for a moment. The mortar fire has a range of 6 miles, so that when your ship is within 6 miles of the mortar battery it can open fire and the ship would have to pass over a distance of 12 miles before getting out of the range of these mortars.

The CHAIRMAN. Now, with respect to these field and siege guns which have been the subject of consideration. Suppose that five or six years ago we had made such equipments of ammunition that you suggest, would this not, as a matter of fact, be entirely out of date now?

General MILES. No, sir. Regarding siege guns and siege howitzers you will notice that on page 47, report of Chief of Ordnance, they are in similar condition to the high-power guns. Regarding field guns, they were found very effective five years ago with the ammunition used at that time.

The CHAIRMAN. With these metal cases for metallic cartridges which are in vogue now and which were not in vogue then; in other words, has not the ammunition been entirely changed?

General MILES. Not entirely changed. Some improvements have been made. If you take the ammunition for the rifle mortars there has been scarcely any improvement.

The CHAIRMAN. But in respect to these field and siege guns?

General MILES. A large amount of field ammunition was found to be defective about two years ago and some improvements have been reported, but the same guns are effective with perfect ammunition.

The CHAIRMAN. Is not the ammunition which is in contemplation now in these metallic cases entirely and essentially different from what was in vogue, say, five or six years ago, and are not the old guns being changed to adapt them to this new ammunition?

General MILES. There has been some change of ammunition. The Board of Ordnance and Fortification has made allotments for the alteration of three 3.2-inch field guns, model 1895, for the purpose of adapting these guns to fixed ammunition and to ascertain which type of mechanism is best suited for the purpose. Please see page 51, Report Chief of Ordnance.

The CHAIRMAN. I understood the field and siege guns were being altered?

General MILES. Field guns may be changed somewhat to make them suitable for metallic ammunition, but that does not prove that they are not effective with the same ammunition with which they were supplied five years ago.

Mr. CANNON. Here is a question I want to put down, and then I want to ask two or three questions without putting them down. Have you examined the estimates from the Ordnance Bureau and the Bureau of Engineers?

General MILES. I examined the main estimates which were made, the annual estimates in the aggregate amount.

Mr. CANNON. As submitted?

General MILES. Yes, sir.

mates were \$7,300,000, and the appropriations \$2,200,000; for 1893, the estimates were \$9,300,000, and the appropriation was \$2,700,000—I will not go further back than that. Now the estimates for 1897 are \$7,414,000. Now then, taking into consideration the defense of the country and the fortification of the seacoast as well as the present defenses of the country under all the conditions, suppose it is the sense of Congress within the next fiscal year to expend \$7,414,633 for guns and fortifications and ammunition, including field and siege guns, if that is intended, is it practicable within the next few days for you to consult with the Secretary of War, you being the General of the Army, and to practically give this committee a revised estimate as to how this money shall be apportioned to the various arms of the service?

General MILES. As the Secretary has made this estimate, I think it a question that should be properly asked the Secretary and not myself.

Mr. CANNON. Well, I wish you would take that question down, and the answer, and call the Secretary's attention to it.

General MILES. You can send it to him, and when he calls my attention to the matter I will give the best information I have to offer. There will not be any want of harmony, I think, but I would rather have it come that way.

MARCH 6, 1896.

REMARKS BY A. H. EMERY, ON AMENDMENT A, PROPOSED BY HIM TO FORTIFICATION BILL.

In regard to this amendment which proposes first to raise the amount from 60 to 85 per cent, to be advanced toward paying for the carriage and its foundations, I should state that my original proposition was that 85 per cent of the \$110,000 to be paid therefor should be advanced to me as the work progressed, and the balance when the carriage was completed and accepted. These advances, however, were none of them to be made for drawings, designs, superintendence, or for the construction of the foundations, but are made only upon accepted castings and forgings and other parts of the metal work by me, an advance being made of so much per pound when I accept these materials for the carriage, and an additional amount when they are inspected and accepted for the work, with a small addition when they are erected, with a stipulation in my letter that all of these advances should not exceed 85 per cent of the amount to be paid for the carriage and foundations. It will be seen, if the cost of designing and making the drawings of this carriage are taken into account, together with the foundations which I must build, that independent of the actual construction of the carriage itself, I have to expend a large sum of money on which no advances are made directly whatever; besides pattern work has to be made, and a very considerable sum of money (several thousand dollars) expended for a special plant for making part of this work, no plant in the country to-day having suitable facilities therefor.

In regard to not being required to return these moneys advanced, I should here state that the Government has in general, without exception, paid for all these experimental gun carriages made for it, and for all the large experimental guns made for it under contract; such payments having been made universally and in no case required to be refunded, whether the carriage or gun was found to be suitable for service use or not. In the present case the foundations for this carriage, which are very deep, heavy, and expensive, are required not simply for temporary firing, but are to be suitable for the permanent use of this carriage, which is not the case in regard to any other of the experimental carriages. They have all been put in simply for the temporary firing, and are of no use for permanency or service. The temporary foundation is a much cheaper one. This foundation, which goes down into the ground many feet, has to be raised above the ground sufficiently to put the axis of the trunnions of the gun when in firing position 30 feet above the ordinary surface level. They are made of steel and masonry, and the part extending above the ordinary surface of the ground is 48 feet in diameter.

Owing to the provision in the present contract of having to return the moneys which may be advanced on account of the carriage and foundations, in case the carriage is not accepted, I have been unable so far to get a suitable party to build this carriage, as the amount of money to be furnished to build this work of the quality which I require even now, in addition to what I have already spent, which is many thousand dollars, is so much larger than the amount to be advanced that the parties who want to do the work of construction, and whom I wish to have do it, do not feel justified in taking the additional risk of having to pay back these advances which they feel it is unjust of the Government to require.

I will here state that the quality of work required to make this carriage what I think it should be for its easy, quick, and permanent working is very much better and more expensive than that in any of the carriages yet made; and it is partly on this account that I wish the premium to be paid for rapid firing as I have asked, should it be earned. While it is my purpose to do this work in the best practicable manner, the work can be done better with the premium than without it. The effort of the subcontractor who makes different parts of this work is in general to get the work off his hands and get his money therefor; but with this premium in view I can make terms for the construction which will make him more careful of the quality of the work and more willing to add all those nice details to make the quick, permanent, and successful working of the carriage in all the directions which are desirable; and to this extent and for these reasons the Government will be much the gainer by offering the premium, whether it shall be earned or not, but which is not to be paid unless earned.

Under the present contract I am not bound or expected to furnish the loading apparatus, but it should be furnished with the carriage; and as I wish to make the carriage and this loading apparatus, we will be able to fire the gun much more rapidly than we will without the loading apparatus and the suitable construction of the carriage for the use thereof. This carriage when so constructed becomes a type of the others which may be furnished thereafter like it, and they, without the premium to be paid on them, will, if the premium is put upon this, have the benefit of these aids to rapid firing; and so the whole gun, carriage, and foundation, with its protecting pit, will be made more valuable by now offering the premium. I should here state that no premium is to be paid unless the rate of firing exceeds fifteen rounds per hour from one gun, which is a little more than they were able to do last fall when the Board fired two 12-inch rifles mounted on the Abbott lifts for rapidity of fire. Thus this one gun is required, in order to get a premium, to do more work per hour than those two guns did.

I should further state that in the case of the second 10-inch (Gordon disappearing gun carriage and in the case of the second 10-inch pneumatic disappearing gun carriage the premiums to be paid are fixed at \$2,000 per round for each round which they could fire over ten rounds per hour, while in my case, with the 12-inch carriage, I get no premium under the terms of this amendment unless the rate of fire exceeds fifteen per hour, which, as I have stated, is double that which they get when firing from the Abbott lift, which raises the gun 14 feet, as does my carriage, while the Gordon and pneumatic carriages only raise the lighter 10-inch gun about 8 feet. I am thus required to fire this larger gun not only more rapidly, but to raise it much higher than they do in order to get the premium.

In regard to its rapidity of fire as between the two sizes of guns, I should state that in firing the 10 and 12 inch guns from the barbette carriages under the directions of the Board last summer for the purpose of determining their relative rapidity of fire, it was found that the 10-inch gun could be fired nearly twice as fast as the 12-inch. This, with the other reasons I have given, it seems are quite sufficient for fixing the amount of this premium, if it should be earned at all, at double the rate per shot which was paid for the 10-inch carriage rapidity test. The amount of work to be done to raise this gun 14 feet, instead of the lighter 10-inch 8 feet, is a little over three times as much. But in the case of firing the 10 and 12 inch guns from the barbette carriages, neither is raised at all, and yet they were able to fire the 10-inch nearly twice as many rounds per hour as the 12-inch. It will be seen, therefore, that from all standpoints what I have to do to earn the premium is much in excess of what any of the others are required to do.

AMENDMENT A PROPOSED BY A. H. EMERY TO THE FORTIFICATION BILL.

That in the act making appropriations for fortifications and other works of defense, for the armament thereof, for the procurement of heavy ordnance for trial and service, and for other purposes, approved February 18, 1893, the paragraph beginning with the words "Of the one hundred and ten thousand dollars" and providing for terms of payment for the 12-inch elevating gun carriage to be contracted for with A. H. Emery under the provisions of said act, be, and is hereby, amended to read as follows:

"Of the one hundred and ten thousand dollars to be paid for the carriage and its foundations, eighty-five per centum shall be paid in partial payments as the work progresses, in accordance with the proposals submitted by A. H. Emery to the Board in his letter of January 21, 1893. And no bonds shall be required for the return of this money if the carriage is not accepted. The balance of the one hundred and ten thousand dollars shall be paid as soon as the test is completed and the work found to be done according to contract. Of the twenty thousand dollars to be paid for the testing of the carriage, three-eighths shall be paid the contractor when the preliminary tests are completed, and the other five-eighths shall be paid to him propor-

tionally as the fifty rounds for proof are furnished; and the Secretary of War is hereby authorized and directed to enter into a supplementary contract with the contractor for this carriage, for the supply by him of a loading apparatus to go with and belong to the carriage, and to be furnished therewith as a part thereof and without any extra charge therefor.

"And this supplementary contract shall provide that in testing the carriage, at least ten rounds shall be fired for rapidity of fire, under circumstances as fair to this carriage and its contractor in all respects as have been accorded to the contractor of any other disappearing carriage, with the proviso that should the gun be able to fire these ten rounds at a rate of rapidity equal to or exceeding fifteen rounds per hour, that payment shall be made at the rate of four thousand dollars per round for each round over fifteen per hour which such test shows the gun can be fired on this carriage; and the amount of the premium which shall be found due and payable under this clause of the contract shall be paid as soon as the test shall determine the amount so to be paid."

REMARKS BY A. H. EMERY, ON AMENDMENT B, PROPOSED BY HIM TO THE FORTIFICATION BILL.

In regard to this amendment, which provides for a contract with me for a 10-inch elevating or disappearing gun carriage, I should say that primarily the Board, for good reasons, objected to ordering a 12-inch and 10-inch disappearing carriage, both of one make, until one at least had been constructed and tested to show some of the advantages of that system; but the large amount of time that has elapsed since the ordering of the 12-inch, caused first by the difficulties of designing the carriage properly to fulfill the conditions fixed for its working, and the time elapsed since those designs were completed, owing to the requirement that I should give bonds to return the money which might be advanced on the carriage and foundations in case of nonacceptance, both make it more desirable to at once order the 10-inch without waiting to complete the 12-inch.

I may here state that the difficulty of designing the 12-inch was very greatly increased by that requirement of the Board which provided that while the carriage should raise the gun 14 feet from loading to firing position, the muzzle of the gun should, when being loaded, stand not more than 1 foot from the parapet, and that the crest of the parapet should not be rounded off, as has been done for other carriages, even when standing much further therefrom.

The time has arrived when the Department is desirous of ordering quite a number of both 10 and 12 inch disappearing carriages, and were my 12-inch carriage now finished and tested and found to be very satisfactory in general and most all particulars, still the Department would not order service carriages for the 10-inch guns to be made on this plan until the 10-inch model had been made and tested. This carriage has a number of particular advantages over any yet tested, among which I may mention that both gun carriage and gunners are much better protected in action than with any other carriage which I know of, and that the gun and carriage are better protected from the elements than are either the guns or carriages made on the other plans.

There is not only better work in this carriage than in the others, but it has many little aids for ease of manipulation, rapidity of fire, and permanence of easy action, which the others have not; and should the result prove that after testing this it may be found desirable to order for service some carriage which may be either cheaper or simpler in construction, still this money will have been well expended, as every new good design put into use shows other inventors and builders how to improve their designs and constructions, even if they do not copy my details.

The cost of these trial carriages does not at all show the cost of the service carriages. In my case I have to make preparation for some special plant for the experimental carriages, which the other builders did not have to do.

All the other carriages required simply temporary platforms and foundations to be tested on, while this requires much larger and heavier foundations erected suitably for permanent use. The first pneumatic carriage—and the second also, I think—was \$48,000, exclusive of foundations and testing, while the first Gordon carriage was \$57,500, and the first 10-inch Buffington-Crozier was about \$43,000, these prices being for the carriages constructed and delivered at the shops where built, and not therefore including the cost of transportation and erection, which was several thousand dollars more for each. The pneumatic and the Gordon each raised the carriage about 8 feet, while the Buffington-Crozier 10-inch raised it only about 6 feet 8 inches, the Government furnishing the design therefor and taking all responsibility of breakage and repairs and suitable action.

The pneumatic and Buffington-Crozier carriages furnished, each gave a horizontal traverse in action of about 120°, while my carriage will revolve 360°. This in many cases enables one gun to take the place of two. The raising of the gun about 12 feet

gives much better protection to the gun, carriage, and men that operate it than we have in the case of the Buffington-Crozier which raises the gun but 6 feet 8 inches. This Buffington-Crozier 10-inch which raises a 30-ton gun 6 feet 8 inches, when tested for rapidity of horizontal traverse, rotated at such a rate of speed when operated by four men to traverse it, that ten minutes would be required to rotate it 240°—that is 120° and back again—while in the case of my 12-inch which raises a 52-ton gun 14 feet, four men will rotate it 360° in one minute, and in the case of the 10-inch, still more quickly.

In regard to the premium for rapid firing, it will be noticed that I get no premium at all unless the rate of fire reaches more than 20 rounds per hour, while in the case of the Gordon and the pneumatic carriages their premiums are for each shot over 10 rounds per hour, so that unless I fire at double the rate of speed they are required to I get no premium; and yet the offering of this premium, as I have before stated, enables me to build a better carriage and to bring out and put into use devices which will help other builders and inventors.

I may here remark that the 10-inch carriage, the design of which I have already commenced, will be much simpler than the 12-inch, and has already proceeded far enough to show me wherein I might very considerably improve that; and it is almost certain that to complete the design of and test this 10-inch carriage will enable me in building additional 12-inch carriages to make them better and cheaper than I could do without the knowledge to be gained by this additional experimental work. This is an additional reason why this carriage should be ordered at this time.

In regard to contracting directly with me, without advertising, for this carriage, I inclose a copy of a letter from General Schofield, the former president of the Board of Ordnance and Fortification, the last paragraph of which reads as follows:

"I also concur fully with your suggestion that in the proposed amendment there be inserted after the word 'contract' the words 'without advertising, with A. H. Emery.' There is manifestly no possible reason for advertising for proposals in a case where no other person can possibly enter into the contract intended to be made."

This letter bears date January 27, 1893, and refers to the contract to be given for the 12-inch elevating carriage.

AMENDMENT B PROPOSED BY A. H. EMERY TO THE FORTIFICATION BILL.

To enable the Board of Ordnance and Fortification to procure and test one ten-inch elevating carriage of A. H. Emery's design, seventy-five thousand dollars, or so much thereof as may be necessary; and the Secretary of War is hereby authorized and directed to contract, without advertising, with A. H. Emery for this carriage, and test it, the same to be built, erected, and tested for a sum not exceeding seventy-five thousand dollars, which price shall cover the cost of the carriage erected, with permanent foundations suitable for its use as a service carriage, and including all the powder and projectiles necessary for its preliminary test by the contractor, and fifty additional rounds for proof, to be fired under the direction of said Board of Ordnance and Fortification, and in the presence of the said Board and the inventor, or his authorized agent, due regard being paid to suggestions offered by him with regard to making such test; said price also to cover all such repairs and changes, if any, as may become necessary to have the whole carriage in good working order after the preliminary test and the test of fifty additional rounds for proof. It shall be constructed on the general plans put before the Board by A. H. Emery, and described by him in his letters to the Board, under dates of November sixteenth and December twenty-fourth, eighteen hundred and ninety-two, and January twenty-first, eighteen hundred and ninety-three.

For the purpose of facilitating the more ready, satisfactory, and quick construction of this carriage and its foundations, the inventor is at liberty to make any and all such changes in the design and specifications for and the construction of this carriage, at any time on or before the completion of the test, as he thinks are desirable for the utility and use of this carriage or repetitions thereof, or which shall facilitate the early completion and successful test of this carriage, which changes or alterations shall all be made at his expense; but no such changes shall be made as will render the carriage unable to fulfill all the requirements in kind set forth by the Board as necessary to be observed and maintained for the construction and use of his carriage and its foundations in their letters to the inventor of dates August seventeenth and November seventeenth, eighteen hundred and ninety-two, fixing the engineering conditions which must be fulfilled and observed in constructing the carriage and its foundations (but with the difference that this carriage shall raise the gun about twelve feet instead of fourteen, as the twelve-inch gun does), unless changes in some of these requirements are sanctioned by the Board.

Of the price of this contract, sixty-one thousand dollars shall be for the carriage and its foundations erected, including all changes and repairs, and fourteen thousand dollars shall be paid the contractor for the preliminary testing of the carriage

and for the powder and projectiles to be furnished by him for the fifty rounds of proof test. Of the sixty-one thousand dollars to be paid for the carriage and its foundations, eighty-five per cent shall be paid in partial payments as the work progresses, in accordance with the proposals submitted by A. H. Emery to the Board in his letter of January twenty-first, eighteen hundred and ninety-three, which is to govern the conditions of advance payments proposed for the twelve-inch elevating carriage. Bonds shall not be required for the return of this money if the carriage is not accepted. The balance of the sixty-one thousand dollars shall be paid as soon as the test is completed and the work found to be done according to contract. Of the fourteen thousand dollars to be paid for the testing of the carriage, three eighths shall be paid the contractor when the preliminary tests are completed, and the other five-eighths shall be paid to him proportionally as the fifty rounds for proof are furnished.

Should any damage be done to the carriage during these tests by the bursting or overloading of the gun which is being fired thereon, or by other guns or projectiles being tested, such damage shall be made good to the contractor by the Government.

This carriage shall be able to train the gun for firing at all angles from five degrees depression to twenty degrees elevation, and have an all-around fire of three hundred and sixty degrees.

In the fifty rounds for proof, the charges may be anything the Board may prescribe, from one-half to the full amount of the service charge of powder, which shall be of a kind to give in no case more than twenty per cent in excess of the ordinary pressures in the chamber of the gun with the service charge now used.

And this contract shall provide that in testing the carriage at least ten rounds shall be fired for rapidity of fire under circumstances as fair to this carriage and its contractor in all respects as have been accorded to the contractor of any other disappearing carriage, with the proviso that should the gun be able to fire these ten rounds at a rate of rapidity equal to or exceeding twenty rounds per hour that payment shall be made at the rate of two thousand dollars per round for each round over twenty per hour which such test shows the gun can be fired on this carriage; and the amount of the premium which shall be found due and payable under this clause of the contract shall be due and payable as soon as the test shall determine the amount so to be paid.

HEADQUARTERS OF THE ARMY,
Washington, D. C., January 27, 1893.

SIR: In reply to your communication of this date, in duplicate, one of which is herewith returned to you, I have to say that in your interview of the 25th instant with the Board of Ordnance and Fortification, you left the impression that it mattered little to you whether you received part payment as the work progressed, giving an indemnity bond satisfactory to the Secretary of War, or received the whole amount after the completion of the tests, in the event of the carriage passing those tests in a serviceable condition. Hence, the Board, considering that it would entirely do away with any legal complications relative to the giving of the bond, or recovery under the same, deemed it expedient to suggest that payments be made only after the completion of the test, conditioned upon the carriage being then in a serviceable condition.

Although the Board is not now in session, and I can not therefore formally obtain an expression of the views of the Board on this subject, in view of the considerations stated in your communication of this date, I think it may be assumed without doubt that the Board can find no objection whatever, if Congress should see fit to provide in the appropriation act for partial payments as the work progresses, in accordance with the proposal submitted by you to the Board.

I also concur fully with your suggestion that in the proposed amendment there be inserted after the word "contract" the words "without advertising, with A. H. Emery." There is manifestly no possible reason for advertising for proposals in a case where no other person can possibly enter into the contract intended to be made.

Yours, very respectfully,

J. M. SCHOFIELD,
*Major-General Commanding the Army,
President Board of Ordnance and Fortifications.*

Mr. A. H. EMERY,
1345 L street NW., Washington, D. C.

MONDAY, March 9, 1896.

Hon. Henry W. Blair, Mr. J. H. Brown, and Mr. A. W. Porter appeared before the committee.

BROWN SEGMENTAL TUBE WIRE GUN.

STATEMENT OF HON. HENRY W. BLAIR.

Mr. Blair said:

MR. CHAIRMAN AND GENTLEMEN OF THE COMMITTEE: I want to occupy but a very few moments and then desire to give an opportunity for these parties to present their own matter. The Brown segmental tube wire gun is a gun which they think is to replace the old method of the built up guns and all other wire-wound guns. It is already in the matter of gun construction of the future a question between wire-wound guns rather than between the built up and wire-wound system, for among experts it has come to be conceded pretty generally that the wire-wound system gives greater efficiency, with greater economy of construction, and on the whole by far the most serviceable gun.

The gun is the great weapon. It rules the world. All military appropriations present and future will be wasted unless they center around the best gun. Hence, money spent in judicious experiments is the most profitably expended of any. The Board of Ordnance and Fortifications was established to enable the Government to avail itself of the inventive genius of the people, which has always been its greatest resource in war as well as in peace.

We desire that the appropriation for the Board of Ordnance and Fortifications be increased beyond the ordinary estimate of \$100,000, so that if, in its discretion, it should think it wise to build a Brown wire gun in order that its qualities may be tested, the Board may have the means and power to do so.

Now, this is a gun which was invented by Mr. Brown six or seven years ago, and its principal peculiarity, compared with other wire-wound guns, is in the segmental feature. The bore, upon which the wire is wound and which gives stiffness and longitudinal strength to all guns in the wire-wound system, is manufactured in longitudinal segments. They made one of the 5-inch guns, and the segments were themselves about 5 inches in radial thickness, corresponding or nearly corresponding to the caliber of the gun itself. That gun was built in 12 segments. It was first planned to be built in 72, but they thought they could get the necessary stiffness and longitudinal strength by making it in 12, and, of course, it was a much cheaper manufacture. They built it 20 feet, nearly, in length (19 feet 6 inches), which is a very great length for a 5-inch gun, as a built-up gun could hardly be constructed that length of that caliber. I believe it to be a general rule that the greater the length the better, because the greater the impetus to the projectile the longer it is impelled by the force behind it.

The stiffness or strength of the gun is, as I said before, in the segmental bore, and that is in longitudinal pieces, which, being applied to each other, fit perfectly, and then the winding is on the surface of this segmental cylinder. First, the ends are fastened together by a muzzle nut and a breech nut, as it is called, and the winding is between the two, the wire being under a tension of 650 pounds. With this gun tests have been made which attained a muzzle velocity of over 3,200 feet per second, and the built-up system, in fact with almost any one of the other wire-wound guns, not exceeding 2,000 to 2,200 feet per second is considered doing excellent business, and I do not know of any gun, even when it was strained exceptionally, which has attained a muzzle velocity of more than 2,500 or 2,600 feet. This gun, on the other hand, has actually attained 3,200 feet per second, and a little in excess of that. Of course, that is the most efficient piece of ordnance which strikes the hardest blow. The force of the blow of the projectile is in proportion to the square of the initial or muzzle velocity. Now, they are confident that, with their gun properly constructed, they can obtain a muzzle velocity of 4,000 feet and more.

The CHAIRMAN. The square of 3,200 feet would be over 9,000,000?

Mr. BLAIR. It would be as the square of 2,000 feet is to the square of 4,000 feet, or as a proper comparison based on well-ascertained facts, the actual striking power would be as the square of 2,200 is to 4,000, the proportion of 4,840,000 to 16,000,000, and they have already demonstrated a muzzle velocity of 3,200, which is the proportion of 4,840,000 to 10,240,000—over 2 to 1. Now this 5-inch gun, which they built wholly at their own expense, was tested partly at the Government's expense, and that gun was discharged 216 times. All these figures are the Government's own records. It was fired some six or eight times before it passed into the possession of the Government, and it was their first gun, built under great difficulties, and one of the segments was imperfectly annealed and they were very shy about putting it into the gun, but these gentlemen had raised their money with great difficulty and they were anxious to get some test, so they allowed it to go in.

On, I believe, the sixth discharge before they turned it over to the Government, their powder, which was a new powder, developed some strange imperfection, which they have obviated, I think, in that style of powder since. The carriage was kicked in all directions, and there was a terrific demonstration. They had the idea that their gun was all blown to pieces; but when they returned to where it was they found the gun was all right and could not see any difficulty whatever with it, so they went on and fired it a few more times, and then turned it over to the Government. It was discharged 192 times, I believe, by the Government, or 196 times, and often at enormous pressures, one, I think, being about 97,000 or 98,000 pounds to the square inch (the conditions of the test requiring only 50,000 at the highest), nearly double the pressure that had ever been obtained in any other gun on the face of the earth—wire wound or of any description. And those higher pressures ranged all the way from 48,000, 60,000, 80,000, and 88,000 pounds up to this enormous one I mentioned, so that, as the Ordnance Department in its report says, "it exhibited very great endurance."

Well, I will say on the two hundred and eighth discharge, including those before they turned it over to the Government, they noticed, just forward of the trunnions, a little smoke; and there is a peculiarity in the construction of this gun, which I do not need stop to explain now, which gives very great strength in regard to the way it hangs on the trunnion. There is a trunnion jacket which incloses the gun so there is no strain upon the body of the gun from the kicking to the rear as the gun flies back and forward within the trunnion jacket, so the entire force which we call kicking—as we boys talked about when we were shooting squirrels—is transmitted to the breech-block, and there is no strain upon the gun at the trunnion at all. But, as I say, on this discharge just forward of the trunnion block there was seen a slight amount of powder smoke escaping, and thereupon they took the gun apart and they found that the liner, originally less than half an inch thick, and which was simply put in to guard against scoring and erosion, and extended about one-third the length of the gun, was cracked in two places, one of them about one-fourth of an inch wide, and that one of the segments was broken at the point where it was supposed to be imperfectly annealed; and it was apparent to the engineers and those who had been familiar with its construction—Mr. Brown, Lieutenant Whistler, and those who knew about it—from the appearance of the break, that that segment had been cracked some considerable time before the final discharge, and they think it was cracked away back at the original discharge I first referred to, before it was turned over to the Government at all.

At all events it had been fired and subjected to very great pressure after this segment had been broken, so that the experiment with that gun demonstrated that even with the segment thus disabled it had a longitudinal strength and power and stiffness necessary to endure these most extraordinary high pressures and to attain these most extraordinary muzzle velocities, although ordinarily if it had been a built-up gun, it would have been blown to pieces and would have been entirely disabled. Now they have got that gun with all the wire as perfect as it ever was, and with the other eleven segments, so that it is only necessary to supply the other segment and it is as good a gun as it ever was. I speak of that because if you should decide upon the construction and use of the Brown gun in the future it is apparent that even disabled guns retain great value.

Now, this liner was the only protection that it had between the powder and the projectile and the bore of the gun during the larger number of these discharges, and that liner was originally less than half an inch in thickness and had never been expected to endure this scoring beyond 150 discharges, and then a new one was to be substituted by the conditions of the Government test; but it kept on doing it right along and right along until they came to the conclusion that this gun would stand anything on earth, and so they fired it sixty-odd discharges beyond what it was originally designed for, at pressures far beyond the test conditions, until at last the liner did break and they discovered this defect in the main part of the gun itself which had been there while the gun was being subjected to these terrible strains. It is a libel to say that this gun ever failed.

MR. CANNON. Was this a 5-inch gun?

MR. BLAIR. Yes; that first 5-inch gun. As these experiments were going along, the Board of Ordnance said they ought to have, before acting with reference to the great mass of gun construction, a model type of a 10-inch gun, and they decided, if they could get the money, to build one of that description. So the 5-inch gun was abandoned for the time being. These parties supposed it was to be done. The Government was appropriating for wire-wound guns, the Crozier and Woodbridge gun, and all that kind of thing. But these people had built their own gun and they had been encouraged by General Benét to bring in a model of the gun—say, an inch in diameter—which they did, and he said he had no doubt the Government would build a large gun of their system. However, the appropriations had fallen out before they could get in on it, so they built the 5-inch gun with funds which were raised by

themselves. There is an association of some 300 or 400 men who subscribed to this from \$100,000 to \$150,000, and as far as I know nobody has ever put more money into an effort to develop a good gun for the United States than these private individuals have; certainly nothing like it in the way of a large ordnance gun.

I was saying the Board of Ordnance decided by a vote, as the record shows, that they designed to build one of these 10-inch guns, but the Chief of Ordnance and Mr. Crozier, a man inside of the Army, have been at work upon the Crozier gun, and all the money has gone and is going in that direction, and the other guns which they have exploited, the Woodbridge gun, etc., so it has been impossible so far to get anything done to help these people. Less than \$10,000 has been spent in testing and on a carriage for the Brown 5-inch gun.

Mr. CANNON. Right at this point, in the last report of the Board of Ordnance and Fortification, I see in reference to this report, "Brown 10-inch segmental wire gun, action postponed." Does that mean the building or testing?

Mr. BLAIR. The tests are all over, because when this gun failed in the way I described to you, which was really a success, it had then demonstrated great excellence, but which the Chief of Ordnance says, without explanation, is a failure; and the other, the Crozier gun, he seems to think is good enough, and he said to me personally that the other gun was good enough and that it was powerful enough, and that in regard to these claims of great velocity and of great power, even if they were true, they did not need so strong a gun. He seems to be well satisfied with our present guns.

Mr. CANNON. Who said that?

Mr. BLAIR. The Chief of Ordnance, General Flagler, in conversation with me in this city since this session commenced, as I understood him; so that I am satisfied that nothing will be done by the Chief of Ordnance to facilitate the ascertainment of whether this is a better gun than the country is now constructing without action by Congress, in which case he would, of course, faithfully carry out the law; and I think he considers the cost of construction still an open question.

Mr. CANNON. The object of your application now is, instead of relying on the Board of Ordnance and Fortification for the authorization of the building of this gun, you want to present the matter to the committee with a view of direction by legislation?

Mr. BLAIR. No, this is what I wish to do. General Miles says in his testimony before Senator Squire's Coast Defense Committee, and I presented this matter to General Miles and he has gone over the subject, and I am satisfied that General Miles thinks it may prove to be a better gun than the country has got—that the Brown wire gun is "a valuable system." The Board of Ordnance and Fortification is made up partly of new men, and partly of old men and I do not know whether to-day it would be in favor of constructing this gun or not, but I am satisfied that General Miles, who is President of the Board, thinks that the country ought to find out what kind of a gun it is, and what I want to ask the committee is this, that you will put the appropriation that is to be available to the Board of Ordnance and Fortification at a sum so that if on further examination they believe it to be for the interests of this country to construct a 10-inch or any other caliber Brown wire segmental gun that they may have available the necessary amount to do it. I suppose that \$50,000 or \$60,000 would be all that is necessary to build a gun and test it. If the Board become satisfied that it is for the public interest, we desire also that they be authorized to contract for a number of the guns.

Mr. CANNON. You do not desire in addition any legislation; you are simply suggesting an increased appropriation?

Mr. BLAIR. Just an increase of the estimate which is, I believe, \$100,000, so if they, on a full examination of this, think it is best to build such a gun then they will have the money available and be ready to do it.

Mr. CANNON. Would you say "Brown wire-wound segmental gun," or would you suggest a mere increase of appropriation with the present authority which would place this gun upon all fours with all other guns? In other words, are you suggesting the use of language in connection with the appropriation which would make this available for the Brown wire-wound segmental gun exclusively, or merely an increase of appropriation which they could utilize within their discretion for this or any other gun, as they may think best?

Mr. BLAIR. In view of all that has occurred between the Government and these parties, it would be the right thing to do, it seems to me, to increase this appropriation, a given amount to be appropriated or allotted in the discretion of the Board for the construction of a Brown wire-wound gun—mentioning it specifically—with such limitations as would give them the opportunity of availing themselves of the services of the inventor at the Government works, or wherever they choose to make it, so it might be sure to be the Brown wire-wound gun, with the benefit of whatever ideas Mr. Brown may have that pertain to his system. But the material thing is the appropriation. The Board will understand what it is for.

Mr. CANNON. I see here in the report the Board recommends some things and the

further trial of some things, and some things are not recommended; but when it comes to this Brown 10-inch wire-wound gun, it says, "Action postponed," and then going over to the next page speaking of experimental guns, they speak of the Crozier wire-wound gun and say it is satisfactory and does well, and they are going to test it further. Now, in the event there was an appropriation sufficient, the authority is already sufficient to utilize any or all of these guns for experimental purposes; but there seems to be an absence of recommendation or estimate?

Mr. BLAIR. There is no estimate in reference to the Brown gun at all, but we made a new application to them and they said they had no funds, but if we applied to Congress then they would act upon the matter. I do not know, now, that I wish to say anything more, and I would rather have any further time the committee should give us appropriated by Mr. Brown himself. He can state to the committee bearing upon the question of the economy and power of the gun, and Mr. Porter has been general manager of this enterprise for a long time, and they know much more about it than I do. Although I do not think that we should arrest current work or the performance of existing contracts, yet if we are to make large future expenditures we ought to get the best gun that is obtainable, and this Brown wire gun has certainly exhibited evidences of very much greater power and endurance than any other. They will show you that it can be built at a greater economy in construction, in less than half the time, and that when disabled it is quickly and cheaply restored to as perfect condition for action as a new gun.

Mr. CANNON. The only object of my asking you these questions was to get at it. I do not know anything more about guns than a hoe handle, and did not know what was the progress before this Board, but if you invest the Board of Ordnance and Fortification with the discretion, necessarily as far as Congress is concerned, from a practical standpoint, you have to take their estimates and recommendations, unless you get that degree of knowledge by which Congress would feel authorized to overrule their recommendation, and hence I directed your attention and your views as to the proper terms of appropriation in connection with this matter as to what you desired and what would give you the relief desired.

Mr. BLAIR. We will practically get it by your making the appropriation large enough. Their present estimate does not include anything for the Brown gun. All we want is that it be done in a way so there will be no question if the Board of Ordnance and Fortification thought it judicious to build one of these guns, then we want the appropriation so it can be done.

The CHAIRMAN. The committee would be glad to hear, at this time, from either Mr. Brown or Mr. Porter, as you gentlemen wish.

Mr. BROWN. Mr. Porter has this subject more at his fingers ends than I have, and I prefer giving him a little time.

The CHAIRMAN. We will hear from you now, Mr. Porter.

Mr. PORTER. Gentlemen, you have listened with a great deal of patience, as I note, to this subject, and I feel very modest about assuming the advocacy of any system of gun construction or any subject before a committee of men who are already burdened with so many responsibilities and who have been selected to represent their States and the United States here in this Congress, and by Congress to exercise a wise and responsible discretion in the appropriation of the public money—and especially for experimental purposes or purposes which are in any degree experimental. We forecast and foresaw all that before we came, and I desire to say, with a great deal of deference and modesty, that we thank you for the patience you have extended to us. You have listened already to Senator Blair on the Brown gun. I merely want to call your attention now to the fact that we have memorialized the Board of Ordnance and Fortification very extensively on this subject, and very recently, and since the publication of this report, and we asked them to give us in writing their reply to our petition laid before them and that they should recommend to you the appropriation of \$45,000 to build an experimental Brown wire-wound gun of this type. They have replied they will at the proper time take the appropriate action, but have not now the money to allot for such purpose.

Mr. GROUT. Are there any other segmental wire-wound guns manufactured now?

Mr. PORTER. None have been manufactured. Now, a segmental wire gun means this: If you can conceive, say, 12, 50, or 70 Damascus steel sword blades, each equal to the length of the gun, tapering to the point, and thinner at one edge than the other, laid side by side, forming thereby a double arc or tube, held together by hoops or clamps until wound with wire, so that the joints are not visible to the eye when the gun is bored and rifled. You can draw steel in that way, or you can get it rolled as thin as desired. Gentlemen thoroughly acquainted with the science of ordnance made the inquiry whether these guns would be stiff enough, because foreign guns drooped at the muzzle after firing on ships, the chase drooping nearly 2 inches below the line of the firing chamber. The segmental tube, made of the same steel, is much stiffer, as the best ordnance experts tell me, than forged steel, or than a drawn tube with solid envelope can possibly be made. It has also greater toughness.

Now then, gentlemen, judge for yourselves whether it is possible for the mind of man or the hand of man to suppose you can get steel, we will say 5 inches thick, or the thickness of the wall at the breech of the steel built up 10-inch gun, of these forgings which are in a long tube—can you take from that piece of steel, or cut out of it, a piece of the form and size of a buggy spring and expect to get from that a suitable spring? Or cut from that size ingot or finished tube a thin strip suitable for the spring of a clock or watch? No; toughness and elasticity for these purposes, as for guns, is gained by working steel in strips suited to each purpose. This segmental wire gun system is not a great, mysterious question; it is a question which addresses itself to the common sense of the plain farmer, blacksmith, or layman who does not need to be an expert in the technology of gun construction to understand it. It is a self-evident fact, and you can all see it. If you want to work steel of the highest possible physical condition you have got to work it in small pieces. You have got to roll it in small filaments in order to have it receive the temper and annealing, in order to give it the physical conditions desired, with the requisite strength and elasticity. We roll this as steel rails are rolled out.

Is there any other means which addresses itself to the comprehension of any man by which steel rails could be afforded or made to stand except by rolling? Now, can you draw a tube from a piece of steel that would stand that? No; the forged rail would not stand as well as the drawn rail. Everybody knows that; and you can roll them in ten times less time than it would take to draw them. You can roll a rail a minute, and of a suitable size for a segment of a core of a 10-inch gun in three minutes, and one that can be better tempered and annealed to answer the purpose of gun metal in any other form. Here is a cross section and longitudinal section of the 5-inch gun spoken of here. This segment can be rolled or drawn. The steel thus worked takes the tempering better than in any other form, and is free from flaws. Mr. Brown will tell you he has been told by Government experts who were employed at Bethlehem to inspect the work there that it is often difficult and sometimes impossible to get an acceptable temper into a drawn tube; that after twenty times reheating and immersing the tube, the test coupon used up, the tube is abandoned. These risks will ever add greatly to the cost of all ponderous forgings for guns of the built-up class. The pieces in a segmental tube are small, and even if lost is small loss. The jackets of wire are small and uniform in temper and toughness; also easily tested.

Mr. CANNON. Let me ask right there. I am ignorant of this, as you know, and I desire to ask about the forgings. I get your idea that this is banded to the muzzle?

Mr. PORTER. This is one of the segments [illustrating].

Mr. CANNON. And that is a thin piece of steel?

Mr. PORTER. Yes, sir; rolled out.

Mr. CANNON. You take all the way from a dozen to seventy, or any other number?

Mr. PORTER. A 10-inch gun is estimated to take 181.

Mr. CANNON. And you put them together?

Mr. PORTER. They are rolled to the proper dimensions, brought together tight by hooks or clamps, and then wound with wire.

Mr. CANNON. Now, as to the forgings of a built-up gun, say, of the same pattern; how are those forgings made?

Mr. PORTER. In the first place, they cast an ingot just the same weight or greater than that the tube is to be when finished or rough finished. There is a hole in that, and it is put on a mandrel; it is reheated from time to time and is drawn under hydraulic pressure.

Mr. CANNON. Now the forging of a built-up gun is one piece of steel?

Mr. PORTER. Yes, sir; the tube is, and it is drawn in the way I have described; they shrink on other outside jackets, one or more; that is called building up.

Mr. GROUT. How far along does it go; does it go to the muzzle?

Mr. PORTER. The hoops or solid envelopes, in some guns do, very nearly; in others, not nearly. Different makers use different number and size of hoops. Some contend small ones are best, and numbers of them; others adopt few and long ones.

Mr. GROUT. Extending to the muzzle?

Mr. PORTER. They are hooped to the muzzle. The French people use numerous hoops and small ones, and our people use larger and longer and less in number. There are advocates of both systems.

Mr. CANNON. Here, say, is the first forging running out here, and now you put the jacket right over that?

Mr. PORTER. It is put on here and here [illustrating], and then another shorter one put on here, and another shorter one on that [illustrating].

Mr. CANNON. So as to get the greater strength where the explosion takes place?

Mr. PORTER. Two or three, or more.

Mr. CANNON. Now, your contention is that your segmental wound gun that you speak of is made of better steel than any of them, and the quality of the steel being better, you get a gun that will stand a greater force from the explosive?

Mr. PORTER. Yes, sir; and we contend the gun is better and cheaper of the same steel.

Mr. CANNON. More than the built-up gun?

Mr. PORTER. Yes, sir.

Mr. CANNON. That is a very enticing theory.

Mr. PORTER. I want to illustrate, for your understanding, gentlemen, by a simple fact you all know, and that is this: You all know if a blacksmith shrinks a wagon tire on a wheel, he has to have his tire a little smaller than the wheel. He heats that tire and puts it on, and it shrinks. If he has made the size of the tire before putting it on a little too small, in the heating it has expanded greatly, and it goes on and shrinks and bulges the spokes; then he has got to take that off and draw it a little before he can put it on again, so as not to have it hug too tight.

Mr. CANNON. I have seen that done.

Mr. PORTER. If it goes on too loose, he has to cut a little piece out and heat it over and take another trial. But, gentlemen, you know, and your common sense tells you, and it is a fact scientifically, that it is not in the power of the blacksmith to put the tires on two, three, or four wheels which will each hug exactly alike. Now, neither is it in the power of the mechanic to put on three rings and shrink them so that each ring will hold uniformly with each other when the expansion takes place so each ring will receive its share of that expansion. What was the condition on the Victoria? One ring holding a little tighter than the other, that ring is taking all the force until the others bear equally with it. Now, that ring is stretched beyond the elastic limit by having the whole force upon it. Then, when the force is taken off, that ring has lost its elasticity, and what is the result? They had to drive wedges, and when it was fired the wedges dropped out on the deck of the ship, and at the twenty-fourth shot the gun was ruined. Now, our people are working much more careful.

They work about one or two one-hundredths of an inch nearer than Armstrong at his factory. Gentlemen, therefore we claim—why should I say we claim; it stands in the immutable laws of nature, and it is not what we claim, but it is simply impossible to make a gun with the same uniformity of tension by shrinking on these jackets as you can when you wind with wire. Mr. Brown not only made this gun, but four working models, and had to make machines to wind the wire. There was no winding machine in the world to wind wire with exact uniformity when he took up this subject. He has made a winding machine by means of which each wire is wound to the ten one-hundredths part of an ounce tension on each wire, so when the expansion takes place each wire takes its exact proportionate part of the strain. An inch square of the wire such as is used is four times as strong as that same steel would be in an inch bar, and a cable made of that wire will lift from the floor four times as much weight as that steel would lift in an inch bar—an inch bar cut, if you please, from any solid envelope on any built-up gun. On this 10-inch gun would be 5 inches thickness of such wire. Can any man doubt the superiority of these segmental tubes and jackets over any other possible tube or jacket?

Mr. GROUT. How thick are the jackets?

Mr. PORTER. According to the size of the gun.

Mr. GROUT. Say for a 10-inch gun?

Mr. PORTER. It would be about 5 inches.

Mr. GROUT. What wire would be put on a 10-inch gun?

Mr. PORTER. Each wire about one-eighth inch cross section.

Mr. GROUT. I mean how thick?

Mr. PORTER. Five inches thick.

Mr. GROUT. And each wire would be over the other?

Mr. PORTER. Yes; a compact body of steel; and the wire, being square, thus makes a wire jacket. It takes to rupture the wire jacket of our 5-inch gun 250,000 pounds pressure to the square inch, and there is no scientist in the world who claims powder gives over 98,000 pounds pressure to the square inch.

Mr. GROUT. There is a certain elastic capacity in the wire?

Mr. PORTER. More than twice that of the same steel in the inch bar.

Mr. GROUT. When this elastic capacity is exercised what is to prevent these segments which lie by the side of each other from opening just a little?

Mr. PORTER. It is the initial compression of the segments at the surface of the bore caused by the higher tension of winding of the wire.

Mr. GROUT. I know; but then it has lost a little of the pressure. You mean the wire is under sufficient power in winding on the segments to actually compress the segments?

Mr. BROWN. Certainly.

Mr. PORTER. The steel is compressed up to its elastic limit, and when the wire yields to the powder pressure a little, the segment expands proportionately, thereby keeping the points tight.

Mr. GROUT. Let me ask what nations are using these wire-wound guns?

Mr. PORTER. The English and Russians, and France is commencing on them.

Mr. GROUT. What is the Armstrong gun?

Mr. PORTER. That is an English built up gun, which we are now imitating in this country, and for which the English are now substituting the wire-wound gun.

Mr. GROUT. Do you mean to say the English fortification board has dispensed with the Armstrong gun?

Mr. PORTER. They have adopted the wire gun.

Mr. GROUT. How recently was that change made?

Mr. PORTER. They began making these guns in 1884, and have hundreds in use in Her Majesty's land and sea service, from a 12 pounder to a 12 inch. The New York papers are now saying it is strange that our Navy (I do not say how true they are), but they say our army and navy boards are wedded to a system which other nations are laying aside. It is a fact that the English and Russians have adopted wire-wound guns, and I think France is beginning now to build the wire wound gun. You understand, gentlemen, there is a difference between a wire-wound gun and a segmental wire gun.

Mr. GROUT. I understand you to say the English guns are not segmental guns in construction—

Mr. PORTER. They are building on the Longridge plant a solid-tube, wire-wound, and they have achieved on that type 2,300 feet per second with cordite or smokeless powder. Mr. Longridge has claimed—

Mr. GROUT. Who is Mr. Longridge?

Mr. PORTER. The inventor of the gun which the English, Russian, and French people are making. "Mr. Longridge has claimed that wire guns can be made capable of resisting pressure far in excess of anything heretofore proposed, thus admitting of materially increasing the efficiency of our seacoast and navy guns. Captain Moeck, the French artilleryist, in a paper read before the Congress of Engineers at the Columbus Exposition, advocates in strong terms the use of wire guns. He considered the wire gun as the gun of the future."

Mr. CANNON. Is the Crozier a segmental gun?

Mr. PORTER. No. You see, gentlemen, by tempering this steel on this plan you can wind the wire a great deal tighter. I want to state what will be an interesting fact to you, that if any of the gun tubes which are made at Bethlehem, or at Essen, or by Mr. Krupp, or anybody else, were wound to the tightness that this wire is wound upon this gun here, it would crush the tube.

Mr. CANNON. You say it would crush the tube?

Mr. PORTER. Instead of being a 10-inch bore it would be considerably less under that high compression; and if again bored to full 10-inch would again yield to less. But in this case, the steel being wrought up to the highest physical condition, the material will stand the highest compression.

Mr. GROUT. It does not affect the integrity of the segments, from the tempering they received?

Mr. PORTER. That is right.

Mr. GROUT. What sort of a machine do you have to put the wire on of the tension desired?

Mr. BROWN. It is not exactly like the tension of a sewing machine, but somewhat on that principle, so as to receive a high tension.

The CHAIRMAN. As I gather from your argument, it is to the effect that a gun built on the segmental plan furnishes greater elasticity to the center of the tube than you could possibly have with a solid tube?

Mr. PORTER. That is the idea, and you gentlemen are considering here to-day not only the best system of guns, but you are considering the best possible system of steel-made guns.

Mr. GROUT. My mind suggests one other inquiry. These segments are drawn and they are simply placed alongside of each other?

Mr. PORTER. Yes; cold.

Mr. GROUT. There is no interjection of any material or anything of the kind, either hot or cold, and then your wire is placed over it?

Mr. PORTER. That is right.

Mr. GROUT. And with sufficient tension, then, to compress these different segments?

Mr. PORTER. That is it exactly and precisely.

Mr. CANNON. Let me exactly understand what you mean about this compression. Here are thirty or forty different pieces of steel a little thicker at the outside than the inside, so as to make a double arch or tube. Now, you put them together and you begin to wind the wire on it and you absolutely bring them together so that the eye can not detect that it is more than one piece. Now, do you say you bring them together so tightly that the pieces of steel are not only absolutely brought together but they are compressed so that that piece of steel is absolutely thinner than before it was wound?

Mr. PORTER. Yes, sir.

Mr. GROUT. Nearly the whole strength of the gun depends upon the wire?

Mr. PORTER. Circumferentially; yes, sir. The segments of this gun can be rolled so that there is no superficial finishing to be done between the segments, but they can be put together as they come from the rolls.

You have already given some attention to the compression, what we call the initial compression, of winding. You can now see that this initial compression under the higher tension sustained by the segmental tube is obtained with greater uniformity as well as higher compression than is possible in any other system. Greater elastic strength is the predominant feature. A gun will expand when the powder explodes.

When the powder explodes if it expands so much [illustrating with hands] and goes back to what it was before that time the gun is perfect, but if the gun should expand at the time the powder explodes and then only goes back less than the expansion you can all see that soon that bore will be so enlarged that the powder gas pours out by the shot, the shot don't take the rifling, and the gun becomes useless even if not exploded or broken, showing the necessity and value of the high elastic limit of the steel in the Brown gun. The Brown gun has stood repeatedly 80,000 pounds to the square inch, 85,000 pounds, 88,000 pounds, and as high as 97,000 pounds. Now, then, the initial compression is what they are seeking to get. Now, what does Crozier do in order to get that compression by wiring on a solid steel tube? He winds that beyond the tensile limit so that, say, the bar was, perhaps, 9½ inches, it would be less than 9½, then he takes that off and he winds it again beyond the tensile limit, and then he takes that off and then he winds it again, and that is the system upon which the Crozier gun is jacketed.

Mr. GROUT. Who is Mr. Crozier?

Mr. PORTER. He is a captain in the Ordnance Department.

Mr. GROUT. Where are these experiments made?

Mr. PORTER. At Sandy Hook. The gun is made at Watervliet, Troy, at the gun shops, and it was some four or five years in construction, and I have heard and I believe myself, from competent ordnance men, I mean men whose knowledge in ordnance is very reliable, that the making of guns in that way, that the particular gun costs \$85,000.

Mr. CANNON. I do not quite understand, and let me ask to see if I have not the correct thing. I ask this instead of asking you to say it over again. In the Crozier gun you take an ingot of steel draw it out and there you have got a solid piece, and instead of shrinking on the jackets you take it out and you wire-wind it, and you wire-wind it so tight, say it is a 10-inch when you began, that when you get through the first winding it is 9½ inches.

Mr. PORTER. I do not know exactly the figures.

Mr. CANNON. Well, say it is 9½ inches.

Mr. PORTER. Yes; exactly.

Mr. CANNON. Then you take that wire and you wind it again and then say it is 9½ inches. Now I am speaking of the Crozier gun, and that is done two times, three times, or four times?

Mr. PORTER. Three times he winds it.

Mr. CANNON. Then, of course, if this is a 10-inch gun and you have a 10-inch bore you have got to bore it out?

Mr. BROWN. Say it is wound down a hundredth of an inch beyond the elastic limit, so you have 9.93 inches, about that?

Mr. CANNON. If you take the wire off it would not go back?

Mr. PORTER. Not quite.

Mr. CANNON. It would go back a little but not quite?

Mr. PORTER. Yes, sir.

Mr. CANNON. You claim that process of winding is very expensive and you claim also it destroys or tends to destroy in whole or in part the elasticity?

Mr. PORTER. Yes.

Mr. BROWN. It is a very expensive way of making it?

Mr. GROUT. You say it would take three or four years to make that Crozier gun. How long would it take to make your gun?

Mr. PORTER. Mr. Brown, how long would it take?

Mr. BROWN. If we were ready to make the gun?

Mr. GROUT. Suppose the type gun was made.

Mr. BROWN. Six months at the outside.

Mr. GROUT. What is the comparative cost of your gun with a built-up gun?

Mr. BROWN. I can not give a definite answer to that, but I can give a comparative answer. The forgings of the built-up gun cost from 25 to 30 cents a pound, and the whole material for my gun can be obtained for not more than 12 cents a pound.

Mr. GROUT. About half what the forgings would cost?

Mr. BROWN. Yes, sir. The labor probably would be about the same. That is about as close an estimate as I can give you; but it requires less skill to make my gun than the other.

Mr. GROUT. What does a 10-inch gun weigh?

Mr. BROWN. About 30 tons.

Mr. GROUT. Half of the cost is in the steel before you begin building, and after that the expense would be about the same?

Mr. BROWN. Yes.

Mr. GROUT. But the 30 tons of material you start with would cost about one-half?

Mr. BROWN. Yes, sir.

Mr. GROUT. And you can do this, you say, in six months?

Mr. BROWN. Yes; from the time I get the type gun finished and ready to manufacture.

Mr. GROUT. That is, if you had the type gun made?

Mr. BROWN. Yes, sir.

Mr. GROUT. Which weighs the most, your gun or the built-up gun?

Mr. PORTER. About the same.

Mr. BROWN. We do not pretend to make them lighter, but we pretend to make them stronger.

Mr. CANNON. What you want is, as I understand, an appropriation of \$45,000, with instructions vested in the Board of Ordnance and Fortification to use that money in the construction of the segmental wire-wound gun.

Mr. PORTER. That is it.

Mr. CANNON. Then they, having the discretion and supervision, would make it or not, as a wise discretion from their standpoint would permit them to do?

Mr. PORTER. We are leaving it entirely to the committee. The committee may leave that entirely to the Board or exercise their own judgment on that point.

Mr. CANNON. Let me ask you, further, how long would it take to make that type gun?

Mr. BROWN. If we could get into a good shop like the Bethlehem, we calculate to have that gun ready to fire in a year, but if we went to the Government shop we could not tell.

Mr. CANNON. It is quite competent for the Board to name the place for the building. How long would it take to make and test that type gun?

Mr. BROWN. The testing could be done, you know, in case of an emergency in three or four weeks. They generally take a long unnecessary time. If we have this gun ready to fire and you say you want it tested in a hurry, it could be done in one month.

Mr. CANNON. Will the explosives be ready by that time to test the gun?

Mr. BROWN. The powder; oh, yes, sir.

Mr. GROUT. What explanation have you to make besides what Senator Blair said in reference to the failure of this other gun of yours? I want to know very particularly about that.

Mr. BROWN. In the first place the gun was made to stand a working pressure of 50,000 pounds per square inch.

Mr. GROUT. You were present, were you not?

Mr. BROWN. I was present when most of these shots were made, but I was not present at the shot that temporarily disabled my gun, nor were any of my representatives.

Mr. GROUT. Do you state as a matter of fact it was fired at 97,000 pounds?

Mr. BROWN. The gauges were compared closely at the Watertown Arsenal, and according to the official report one gauge showed a compression due to "96,000 or 97,000 pounds per square inch."

Mr. GROUT. And the contract was only for—

Mr. BROWN. The contract was for 50,000 pounds, and the gun was made to stand that. The contract was made with the Board to fire 50,000 pounds maximum pressure.

Mr. GROUT. And you say it was fired at 97,000 pounds pressure?

Mr. BROWN. The gauges were sent to Watertown Arsenal for examination, and their report was 96,000 or 97,000 pounds per square inch.

Mr. GROUT. When you say "our engineer," do you mean an engineer of the Army?

Mr. BROWN. A consulting engineer, Lieutenant Whitter, of the Fifth Artillery, who was assigned to us to look after this work.

Mr. PORTER. He was given five years' leave of absence under half pay to work on that gun. He worked faithfully on that gun five years. We have elaborate drawings, volumes of theoretical calculations, and all that, which we could lay before you, but we have done that with the Board of Fortification.

Mr. GROUT. Now, I understood Senator Blair to say, inferentially, perhaps, rather than by express statement, that when the gun was constructed some misgivings were felt about a certain piece?

Mr. BROWN. Not in regard to any special piece. There were some misgivings by myself of the whole entire segmental core, because it is made by hand in a crude way and in a crude furnace.

Mr. GROUT. Where was it made?

Mr. BROWN. Birdsboro, Pa.

Mr. GROUT. It was made under your control?

Mr. BLAIR. They want to know everything in regard to it.

Mr. BROWN. In the first place, these bars or forgings were made by Mr. Carpenter (a man who had just gone into the steel business) out of chrome steel, and then they were tempered in a rough furnace built up, of course, just temporarily at Birdsboro, Pa., and they used a wood fire; so, as I said, it was very crude.

Mr. GROUT. How long ago was that?

Mr. BROWN. About four years ago. Now you ask me that, I will give you another reason. Our engineers and myself did not know as much about the theory of the gun construction then as we know now, and we made this gun of very much higher physical conditions than we find it now necessary to put in them.

Mr. GROUT. What do you mean by "physical condition?"

Mr. BROWN. I mean the elastic limit of these segments especially was 100,000 pounds to the square inch. The higher the elastic limit of the steel, the more difficult it becomes to work; that is, the steel has not the elongation and toughness it should have had. If we had used about 70,000 or 80,000, or 65,000 pounds elastic limit we would have had twice the toughness. We could have doubled these bars right up and never have broken a bar. That we learned by experience.

Mr. BLAIR. What have you to say in regard to the bar being broken before the conclusion of the firing?

Mr. BROWN. Well, that is supposition, but there is no doubt it was broken before the last shots, because the last shots were fired at a low pressure, by the official reports. There is no doubt the bar was broken on the sixth shot before we turned it over to the Government.

Mr. CANNON. What bar do you speak of?

Mr. BROWN. One of the twelve bars in the gun which cracked.

Mr. CANNON. Where was that cracked?

Mr. BROWN. It was about half-way down to the trunnions.

Mr. PORTER. And it would then have been fired 200 times after the segment cracked?

The CHAIRMAN. Just before you leave that, you were speaking about having this appropriation expended under the direction of the Board of Fortification and Ordnance, or at their discretion. Would there be any objection to having the matter referred to the discretion of the Secretary of War?

Mr. PORTER. None in the least; or the committee, or Congress.

Mr. HEMENWAY. How long does it take to make a 10-inch built up gun?

Mr. PORTER. They get their forgings, generally, in about a year.

Mr. HEMENWAY. How long does it take to complete the gun?

Mr. PORTER. Well, Mr. Brown, do you know?

Mr. BROWN. They can probably complete a gun in six months if they were rushed.

Mr. HEMENWAY. That is, after they get the forgings?

Mr. PORTER. I think now they can probably do it in fifteen months, forgings included.

Mr. GROUT. What is the relative length of the built-up gun and your gun?

Mr. PORTER. We should make our gun 44-caliber, and they make theirs about 35. We can make ours any dimension. The Navy has 40-caliber and the Army 35, and the European people make them 50-caliber.

Mr. BLAIR. The longest gun is the best gun?

Mr. BROWN. I would just like to make one point. I made a statement before the Board of Ordnance and Fortification if guns were wanted in a great hurry we could make our guns in an unlined condition that would give as much energy as the present guns they are making and could be made in half the time and for about one-half the money the present built-up gun costs and the work distributed in many outside shops. I made that statement before the Board of Ordnance and Fortification.

Mr. GROUT. Your estimate some time since would hardly sustain that statement, because you say the work is about the same but the material is half the cost of the other.

Mr. BROWN. I was speaking of the lined gun. Now I am speaking of the unlined gun. Without putting in the liner it would be a low-power gun, giving a velocity of about 2,000 feet per second.

Mr. GROUT. Then, it is your unlined guns you can build for about half the cost of built-up guns?

Mr. BROWN. Yes, sir; I want to make this gun especially for using and to be tested with smokeless powder.

Thereupon the committee adjourned.

FURTHER STATEMENT BY MR. BROWN.

ECONOMY OF THE BROWN WIRE GUN.

This consists not only in a saving in the cost of each gun made or contracted for of this class, which would be in itself sufficient to justify a test of the system up to the 10-inch size, as now asked for by these petitioners, at the expense of the Government. But what is of greater consequence to the people of this country is that it may also prove a preventive of the necessity for rebuilding the ordnance, as hitherto done, twice or three times each century because of improvements in the weapons of other nations. As there seems to be abundance of reason to hope this is the end of improvement in the method of preparing steel cheaply and economically, both physically and pecuniarily for this class of construction, as well as of making it into the guns themselves, at least for an extended period, the people may enjoy immunity from such taxation and in economy of plant, as a well-equipped steel works needs but slight addition of tools to assemble these guns, and the forgings can be supplied to a large number of such shops from a rolling mill from any point.

I quote from the Engineer's report, which I hand you herewith:

"The segment was undoubtedly cracked by one of the excessive wave pressures, due to the existence of a hard or brittle spot in the metal.

"The segment was probably broken either at the sixth round—pressure, 78,000 pounds per square inch [one of the gauges used in the gun at this shot was by the commandant of the Watertown Arsenal, after comparative examination by him, reported to have shown a compression due to 96,000 or 97,000 pounds per square inch]—or at the one hundred and fifty-seventh round—pressure, 82,850 pounds per square inch. In either case the gun was fired many times under pressures of 50,000 pounds per square inch and over after the segment was broken."

Had the liner been of sufficient thickness or been renewed after the one hundred and fiftieth shot (as agreed and understood we were permitted by the Ordnance Board to do), the cracked segment would never have been discovered.

I would state that my gun was partially and temporarily disabled only, and through no fault in the system, but rather through the lack of experience and knowledge and proper precaution in the use of such greatly excessive powder charges in the first shots of the private trial. The pressures developed in these shots would have been sufficient to quite destroy guns of any other system of construction before they came to the official test. This, therefore, instead of being construed as a failure of the system was, on the contrary, the highest proof of its superior endurance over all others.

All the injury and temporary disablement was sustained with pressures nearly double that and what was agreed to be the maximum working pressure of the test, namely, 50,000 pounds per square inch. Eight shots run from 65,000 to 97,000 pounds per square inch. Seventy shots were with pressures above 50,000 pounds per square inch; these are included in official and private tests. There is no parallel in the history of ordnance to the severity of this record of the test and endurance of a piece of ordnance. This was a 5-inch gun, with powder charge from 30 to 40 pounds, and solid steel projectiles weighing from 60 to 62½ pounds each; velocity maximum, 8,235 foot-seconds; muzzle energy, 1,085 foot-tons per ton net of gun.

I attribute the eight highest of those pressures, in addition to the overloading, to what has been designated as "wave motion," which I believe to be due to pressure suddenly raised at the rear of the chamber (this being in my 5-inch gun 44 inches long).

This pressure at the rear end, where ignition begins, drives the unburned powder forward into the bottle neck of the chamber, at the heel of the shot, first packing, then compressing the powder there, hermetically sealing the chamber and producing the effect of powder burned in its own space, without vent, until the compressed powder is burned so that the dammed-up pressure of the powder gas is relieved to act upon the projectile.

At all events, I stopped this dangerous and destructive action by the use of the long central priming charge. This is a small muslin tube placed in the center of the charge, extending from front to rear, loaded with quick-burning rifle powder, thus causing ignition by electric spark to be communicated to the rear, front, and through the middle of the charge at nearly the same instant, thus causing uniformity of pressure to rise as the charge burned through all parts of the chamber at once. And no unavoidable, unexpected, dangerous pressures have been encountered in my gun or any other since, where this long priming charge is applied. This will save to this Government many breech actions, guns, and probably lives, as well as battles. By this the projectile moves at a few tons pressure and the accumulating gas from the slow burning powder steadily keeps up this pressure until the shot leaves the muzzle, thereby securing a better result of firing as well.

ADVANTAGES OF THE BROWN SEGMENTAL SYSTEM OF WIRE-GUN CONSTRUCTION.

The value of wire as a means of reinforcing the strength of cannon has been recognized for many years. Dr. Woodbridge, in America, and Mr. Longridge, in England, have endeavored to impress the authorities with the advantages to accrue from the adoption of wire guns.

Dr. Woodbridge has now a 10-inch B. L. rifle undergoing test at Sandy Hook.

Mr. Longridge has made a decided success abroad, both in England and Russia, where his guns up to 10-inch caliber are in actual service. The Russian flagship lately in our waters was armed with these wire guns.

Mr. Longridge has claimed that wire guns can be made capable of resisting pressures far in excess of anything heretofore proposed, thus admitting of materially increasing the efficiency of our seacoast and navy guns. Captain Moch, the French artilleryman, in a paper read before the congress of engineers at the Columbian Exposition, advocates in strong terms the use of wire guns. He considers the wire gun as the gun of the future.

While these claims have long been made, the first attempt to actually construct a wire gun capable of resisting these enormous pressures, and in fact the first practical system whereby such a gun could be constructed, was that devised by Mr. J. Hamilton Brown. This gun is known as the Brown segmental wire gun.

The fundamental principle of this system of gun construction consists in constructing the core of the gun of a number of small pieces of steel (longitudinal bars), thus admitting of the use of the highest grade of crucible chrome steel and of producing the most perfect condition of temper. It is admitted even by those who are not in favor of the adoption of wire guns that the Brown segmental system is theoretically the most perfect system of gun construction. The only objection offered by the Chief of Ordnance of the Army in his last report to this system was that, in his opinion, it would be uneconomical; and, further, that he thought, with the advances lately made in metallurgy, that he could construct a steel built-up gun equally as strong.

In reply to the first of these statements Mr. Brown claims that he can build one of these guns for less money than the amount estimated by the Ordnance Department for hooped guns of *similar ballistic value*. Concerning the second statement we would reply with Captain Moch, that any discovery in metallurgy which will increase the strength of a hooped gun will still more increase the efficiency of a wire gun. How much more is this true of the Brown segmental wire gun, in which the strains are subdivided in such a manner that we utilize the maximum strength obtainable from the metal. The experimental 5-inch Brown segmental wire gun now undergoing test at Sandy Hook, which was constructed upon this system under Mr. Brown's immediate supervision, was constructed to sustain a powder pressure of 60,250 pounds per square inch. The battering pressure was, however, fixed at 50,000 pounds per square inch.

This gun has now been fired 216 times; 60 of these rounds were with service pressure of over 37,000 pounds per square inch; 70 with battering pressures of over 50,000 pounds per square inch; 7 rounds with over 60,000 pounds per square inch; 4 over 70,000 pounds per square inch; 1 over 75,000 pounds per square inch, and 1 gave the enormous pressure of 82,950 pounds per square inch. When we remember that the maximum pressure used in the new high-power guns of the Navy is 15 tons per square inch, equal to 33,600 pounds per square inch, and the pressure used in the army guns about 37,000 pounds per square inch, we begin to realize the enormous test to which this gun has been submitted. So far as the strength of the gun is concerned, it is in as good condition as when first made. To comprehend the value of these enormous pressures we should compare the results obtained with similar high-power guns. The 5-inch Brown segmental wire gun is, however, unlike any other 5-inch gun, and is, therefore, not comparable therewith. We may, however, obtain an idea of its value by comparing the results obtained with excessive pressures with those obtained with ordinary pressures in the same gun.

The remarkable results obtained in this gun were all obtained with the Leonard smokeless powder; and in order to determine how much of this was due to this remarkable powder, and how much to the strength of the gun, we must compare the maximum velocity obtained with a velocity obtained with the same powder at the ordinary service pressure.

The best result obtained with the Leonard smokeless powder and a service pressure was 2,790 feet per second muzzle velocity; and the greatest velocity ever obtained with excessive pressures was 3,235 feet per second muzzle velocity. The difference of 445 feet per second was, therefore, due to the strength of the gun. This is an increase of 16 per cent over what could have been obtained from a gun constructed for ordinary service pressures, which means a gain of 35 per cent in muzzle energy, and, therefore, in practical efficiency.

The enormous pressures used in this gun have scored the bore to a very considerable extent, and the lining tube, after having been reduced by this scoring to a thickness of a quarter of an inch, cracked on the two hundred and sixteenth round. It was not expected that this liner would stand over 150 rounds.

This liner was introduced as an experiment, to determine whether it was practicable to use very thin liners, and extended for only 75 inches down the bore. The liner will now be removed and replaced by a continuous lining tube from breech to muzzle; and all Brown segmental wire guns constructed in the future will be lined from breech to muzzle.

The remarkable results obtained with this gun opened up the discussion as to the value of these high pressures, and the chief, if not the only argument, used in reference to this system of gun construction is that "we do not need such a strong gun." In reply to this we would ask whether the fact that a gun possesses the quality of excessive strength would be considered as a detriment, particularly as this gun can be constructed for less money than the present type of hooped guns. The objectors state that the service pressure is sufficient to give velocities which will penetrate our present armor. The question is, whether it will be sufficient ten years hence. Should the Government adopt the Brown segmental wire gun, they will have a system of guns which will be able to stand a pressure more than sufficient to meet any improvement that is likely to be made in metallurgy for many years to come. For this reason this system of gun construction would be economical, even should it be found that wire guns cost more instead of less than steel built-up guns of the same ballistic value. The contest has long been between the gun and the armor, and the late experiments in Harveyized steel plate would seem to indicate that armor was slightly in the ascendancy. The Brown segmental wire gun, however, furnishes a system capable of sustaining such enormous pressures that it must be many years before an armor plate can be constructed capable of withstanding the shock produced by a shot fired from one of these engines of war. If at present there is no need for a pressure greater than 37,000 pounds to the square inch, no higher pressure need be used, thus materially increasing the life of the gun.

Captain Moch advocates increasing the efficiency of seacoast and navy guns by such improvements in gun construction as will enable us to use very much higher maximum pressures. The modern seacoast and navy gun is preeminently a battering machine, intended mainly for the purpose of penetrating armor, and every gun intended for such purpose should be capable within its battering range of penetrating any armor afloat, penetrable by its class.

In no war would any seacoast gun with reasonable probability be required to fire more than 50 such battering rounds, and no navy gun would be required to fire over 100 such battering rounds. The criterion of battering efficiency should therefore be determined as follows: A seacoast gun should be capable of firing 50 rounds at battering pressure and a navy gun 100 rounds at battering pressure without becoming, by scoring, so inaccurate that a vessel could not be hit within their respective battering ranges.

The results of the test of the 5-inch Brown segmental wire gun at Sandy Hook have demonstrated that a 10-inch Brown segmental wire gun can be constructed capable of sustaining, without in any way decreasing its tangential resistance, a pressure of 60,000 pounds per square inch. With such a gun and with a proper charge of Leonard smokeless powder we could obtain a muzzle velocity of 3,200 feet per second; this would give us sufficient energy at 3 miles range to penetrate any armor afloat. It is undoubtedly true that 100 rounds with 60,000 pounds pressure to the square inch would score the gun so terribly as to render it inaccurate for fine target-practice work, but it would be sufficiently accurate to insure hitting a vessel at a range of 3 miles. After the war is over the scored liner can be removed and a new one inserted, thus practically making a new gun. Thus relined this gun will be capable again of withstanding a similar number of battering charges, although its life will, of course, have been reduced by the number of shots fired.

This is, of course, a very broad claim, and the Board of Ordnance and Fortification deem that even the remarkable results obtained with the 5-inch experimental gun do not demonstrate that similar results can be obtained with the 10-inch gun. They, however, consider the results of sufficient importance to warrant the Government in constructing an experimental gun upon this system, and have so recommended in their report to Congress.

We would therefore respectfully urge that not only have the results obtained been sufficient to warrant the Government in expending this money, but that in view of the fact that the entire expense attending this test, with the exception of less than \$10,000, allotted for ammunition and testing, has been borne by private parties, it would seem only just that the Congress of the United States should appropriate a sufficient amount of money to construct experimental guns for the Army and Navy of sufficient size to thoroughly demonstrate the value of this remarkable system of gun construction.

G. N. WHISTLER,
First Lieutenant, Fifth Artillery, Engineer for Trustees.

NEW YORK, 1895.

BROWN SEGMENTAL WIRE GUN.

Engineer's report, by First Lieut. G. N. Whistler, Fifth Artillery, engineer for trustees to the Trustees.

GENTLEMEN: In presenting for your consideration a report of the result of the official test of the 5-inch experimental Brown segmental wire gun, I can not do better than to open my report by quoting from the Report of the Chief of Ordnance, United States Army, for 1894.

EXPERIMENTAL GUNS.

The Brown 5-inch segmental wire gun.—The test of this gun was completed during the past year, the total number of rounds fired being 192. After the one hundred and ninety-second round, which was with a charge of 36 pounds of brown prismatic powder, giving recorded pressures of 50,956 and 48,450 pounds per square inch, respectively, in the two gauges used, two large cracks were discovered in the lining tube. The upper crack was about one fourth of an inch wide at its widest part and the lower one slightly narrower.

A considerable quantity of gas escaped from the outside under the front edge of the trunnion tube, which had presumably passed through the staves and wire wrapping of the gun. The joints between the staves in the whole unlined (forward) portion of the gun was distinctly marked. The gun being thus rendered unserviceable, the test was suspended and permission given the company to remove it for dismantling. It was found upon removing the jacket that one of the segments had parted at about 34½ inches from the breech. The escaping gas had cut the wires at this point, leaving an opening about one-eighth of an inch wide—the full width of a segment from lining tube to the space between wires and jacket. The escape of gas was thus accounted for.

The bore was considerably eroded and scored, but the segments, with the one exception, were intact. From the appearance of the broken segment it seems probable that rupture had taken place some time before the discovery of the escape of gas, but how long before there was no means of determining.

The records of firing show that the gun was subjected to the following average pressures, viz:

- 45 rounds with pressures between 30,000 and 40,000 pounds per square inch.
- 51 rounds with pressures between 40,000 and 50,000 pounds per square inch.
- 43 rounds with pressures between 50,000 and 60,000 pounds per square inch.
- 2 rounds with pressures between 60,000 and 65,000 pounds per square inch.
- 1 round with a pressure of 65,000 pounds per square inch.
- 1 round with a pressure of 65,410 pounds per square inch.
- 1 round with a pressure of 76,500 pounds per square inch.
- 1 round with a pressure of 82,850 pounds per square inch.

Some of the higher pressures may undoubtedly be referred to wave action and to recognized defects of the measuring apparatus to meet as high pressures. Similar high pressures have been registered in our hooped steel guns of 8, 10, and 12 inch calibers, and which they have endured without apparent injury. During the progress of the trials 48 rounds were fired with Leonard smokeless powder and some excellent ballistic results obtained, although the pressures were intentionally high. The report on the trial of this gun forms an appendix to this report.

The Ordnance Department has since 1876 made tests of four wire-wound guns, heretofore described in this report, and has on trial one more—the Crozier gun herein described. As stated, all of these guns were manufactured by the department, except the 5-inch Brown segmental gun. All of the guns except the one still under trial, as has been stated in this report, have failed; but the "5-inch Brown segmental gun showed great endurance."

It will be remembered that the experimental gun was lined only from the breech to about the trunnions, it being the desire of the inventor to thoroughly test and determine whether it was practicable to rifle directly upon the segments, and to use the gun without a liner. The liner was exceedingly thin, being less than one-half inch at the thickest portion and about three-eighths inch at the thinnest. The object of using such a liner was to determine whether it was practicable to use a liner so thin that it could be readily drawn into the gun under maximum compression by hydraulic power. The liner was not expected to stand but 150 rounds, when it was to be removed and a new one inserted. This was agreed to and understood by the Ordnance Board and made part of the conditions of the test. It was consequently no surprise when a crack was discovered at the one hundred and ninety-second round of the official test (being the two hundred and sixth round fired in the gun). The report that gas had escaped about the trunnion jacket was, however, unaccountable.

I am free to admit that the liner was entirely too thin. In making computations the excessive scoring and pitting in spots, due to such high pressures, was not allowed for. After removing the liner, pits were found which had reduced the thickness of the liner in places to less than one-fourth of an inch. Liners should be constructed so that after the maximum scoring the metal should still be at least one half inch in thickness.

After removing the liner, one segment was found to be cracked entirely through, near the breech of the gun. The word "parted" used by the Chief of Ordnance hardly conveys the correct idea; there was no evidence that the segment had pulled to pieces; in fact, there had been absolutely no longitudinal motion of either portion of the segment. The segment had been broken by a blow, not by a strain, and the crack so formed had been enlarged by the action of the powder gas. The segment was undoubtedly cracked by one of the excessive wave pressures due to the existence of a hard or brittle spot in the metal. The segment was probably broken either at the sixth round, pressure 78,000 pounds per square inch, or at the one hundred and fifty-seventh round, pressure 82,850 pounds per square inch. In either case, the gun was fired many times under pressures of 50,000 pounds per square inch and over after the segment was broken. Had the liner been of sufficient thickness, or had it extended through the entire length of the bore, the fact that a broken segment existed would never have been discovered. This demonstrated what has always been claimed for the system, that a flaw or weak place in a single segment does not materially weaken the gun.

It must be remembered, in this connection, that this was Mr. Brown's first experience in great-gun construction; that he was using a higher grade of chrome steel than had ever before been used in gun construction; that little or nothing was known as to the proper method of tempering chrome steel except for tools; that he had no proper tempering furnace, and that the segments were heated for tempering in the open by a wood fire. In addition to this, remember that he was endeavoring to produce special elastic limit of 100,000 pounds per square inch in a crucible gun steel, something, so far as I know, never before attempted. It is therefore not surprising that when this gun was submitted to a continued series of pressures greater than ever before used in any gun that a single hard and brittle spot should have been developed. It must be manifest to anyone familiar with steel manufacture that such conditions can be avoided in the future, particularly as experience has taught us that an elastic limit of 75,000 pounds per square inch is all that will be required in the segments.

On dismantling the gun every anchorage was found to be intact, and, except right at the break, every layer of wire was in as perfect condition as when first put on the gun.

The scoring, except right at the end of the liner, where the rifling had become distorted as stated in a previous report, was not excessive. There was no evidence that there had been any motion whatever either of segment, hoop, or nut. In fact, with the exception of the one segment and liner, the gun was in as good condition as when first completed, and this after having stood a greater strain than that to which any other gun has ever been submitted.

The trustees have every reason to congratulate themselves on the result of the test, although the gun, as stated by the Chief of Ordnance, failed after showing great endurance. This failure was one of detail, and in no way affects the system. As already stated, no gun has ever before been submitted to such a severe test, and the system has been demonstrated to be all that was claimed for it by the inventor. We may make the following deductions from the result of the test:

(1) The Brown segmental system of wire gun construction has ample strength both circumferentially and longitudinally to stand the most excessive powder pressures.

(2) While the unlined bore was scored the scoring was not excessive and the results demonstrated that in case of war unlined guns could be constructed rapidly, which would have sufficient life for the war and could readily be lined and rendered as good as new after the war was over.

(3) The gun should be lined throughout its entire length; a liner divided in two parts is not desirable unless the rear liner can be left smooth-bore.

(4) The liner used was entirely too thin for the work required of it.

(5) There is no necessity for using the extreme condition of special elasticity which was obtained in the segments of the experimental gun.

(6) The free trunnion jacket acted in a most satisfactory manner; the soundness of the principle involved was unquestionably demonstrated.

(7) The working of the breech mechanism was all that could be desired.

(8) The soundness of the method of attaching the breechblock to the trunnion jacket by the means of an intermediate free bushing was clearly demonstrated.

(9) Mr. Brown's method of winding and anchoring the various layers of wire proved to be an entire success.

In conclusion, I am prepared to state as my opinion that high-powered guns can be constructed upon the Brown segmental wire-gun system for less money and of higher efficiency than by any other system of gun construction.

Referring to the general discussion upon the subject of wire-gun construction, by the Chief of Ordnance, I would simply take exception to the statement that the steel built-up gun has greater stiffness than the wire gun. This, of course, is merely a repetition of Captain Birnie's statement. The segmental core of the Brown gun is probably relatively the longest wire-wound tube compared to its diameter ever constructed. The skilled mechanics employed in the shop where it was made pronounced it to be the stiffest hollow shaft that they had ever had in the lathe.

I am satisfied that actual test will demonstrate that a properly constructed wire-wound gun is stiffer than a built-up gun, and that the Brown segmental system is the stiffest form of wire gun.

Respectfully,

G. A. WHISTLER,
First Lieutenant, Fifth Artillery, Engineer-for Trustees.

FRIDAY, March 6, 1896.

The subcommittee of the Committee on Appropriations, having under consideration the fortifications appropriation bill, this day met, Hon. Eugene J. Hainer in the chair.

The CHAIRMAN. Gentlemen of the committee, yesterday morning at the conclusion of our hearing, acting upon the suggestions which were made, I addressed a telegram to the Secretary of War, and have received from him the following reply:

WAR DEPARTMENT, OFFICE OF THE SECRETARY,
Washington, D. C., March 9, 1896.

MY DEAR MR. HAINER: I have your telegram, and regret that an important meeting of the Cabinet to-morrow morning compels me to ask your indulgence in this regard. Instead of coming to you in person, I will, with your permission, make a reexamination of my estimates to-night, with the assistance of the officer—Captain Bliss—who aided me in their original revision, and will send him to your committee to-morrow morning with the results. Captain Bliss thoroughly understands my views, and will be able to answer any inquiry as to policy or judgment.

I understand that it has been proposed by a member of that Board that more authority in the way of executive control should be lodged with the Board of Ordnance and Fortifications. This, in my judgment, would be most unwise. That Board was established for a very different purpose, is composed, with a single exception, of Army officers charged with regular and important duties, most of whom have stations at posts other than Washington, and whose training and experience have been in other lines than those now suggested. If discretion as to allotment of appropriations for fortifications is to be exercised in this Department, it should be by the Secretary of War.

Very respectfully, yours,

DANIEL S. LAMONT.

HON. E. J. HAINER,

HOUSE OF REPRESENTATIVES, *Washington, D. C.*

The CHAIRMAN. It affords me pleasure, gentlemen, to introduce to you Captain Bliss, who is the officer representing the Secretary of War and to whom reference is made in this communication. Captain, we will be pleased to hear from you in respect to matters touched upon in this letter.

STATEMENT OF CAPT. T. H. BLISS.

Captain BLISS. Mr. Chairman, I would like to state that, as I did not know until at a late hour yesterday that I was to appear before this committee, I have not been able to prepare a written statement, and in what I am about to say must rely entirely upon my memory and a few notes here before me which I have made from time to time for the information of the Secretary of War. I think, therefore, that it would facilitate your investigation if you were to prompt me by leading questions instead of relying upon an otherwise unaided statement from me.

The CHAIRMAN. It was suggested yesterday, among other things, that thus far we have progressed more rapidly in providing guns than in other elements of defense, and, in short, that it would require an appropriation of about \$10,000,000 to bring our quota of carriages, emplacements, and ammunition, including projectiles, up to the standard of the guns now completed or that will be completed by July 1 next, and that the first \$10,000,000 which could be profitably appropriated or expended should be directed to bringing up the quota of emplacements, carriages, and ammunition to the standard of the guns. That leads us to an inquiry of whether or not, in view of this suggestion, the Department has contemplated a revision of these estimates, or whether or not it adheres to the estimates which have already been submitted to this committee for its information. That opens up the general subject.

Captain BLISS. In that connection I will state the substance of interviews had with the Secretary of War upon this subject yesterday and this morning. You will note that it was the Secretary of War who, in his recent annual report, first called particular attention to the disparity in the rate of construction of the three principal items necessary for coast defense, viz, the number of guns, as compared with the number of carriages and with the number of emplacements for them—the guns and carriages being purely ordnance work and the emplacements being purely engineering work.

Before attempting to give the views of the Secretary of War in regard to the estimates now before the committee, what should be the proportion to be maintained between the sums now to be allotted, respectively, to the two bureaus of ordnance and engineering, and what should be maintained in the event of Congress fixing a definite sum for the completion of the whole work and an annual rate at which that sum should be expended, it is necessary, in order to prevent any misapprehension, to understand how it is that the disparity in the rate of construction just noted has come to exist, and why the Secretary of War first directed special attention to the fact this year. The existing condition as respects these three items in our coast defenses is shown in a table which I have here, hastily prepared in pencil, the figures of which are of somewhat later date than those given in the report of the Secretary of War.

It appears that at this moment the emplacements (that is, the engineering work) which have been completed or are under construction, and for the completion of some of which money has been allotted, and the guns and carriages built or building, are as follows: For the 8-inch guns there are seven emplacements, completed or in process of construction. On the 1st of July last there were fifty-one 8-inch guns completed, showing a great discrepancy between the number of these guns and the number of emplacements in which to put them.

But, at the same time, there were only fourteen carriages, either built or in process of building, for these fifty-one guns. For the 10-inch guns the engineers have completed or are building twenty-three emplacements, while on July 1 last the ordnance officers had ready thirty-three guns. The number of carriages, built or building, for these thirty-three guns is thirty-five; thus, excluding others yet to be provided, there would be two more carriages than guns, and ten more guns than emplacements. For the 12-inch guns the engineers have built or are building eight emplacements, while on July 1 last the Ordnance Bureau had completed fourteen guns and have now built or are building ten carriages for them. For the 12-inch mortars the engineers have built or are building eighty-eight emplacements, while the Ordnance Department has completed seven mortars, has bought seventy-seven from private companies, and has six more in process of construction.

Thus, as the matter now stands, the engineers are two emplacements ahead of the ordnance as regards carriages for the 12-inch mortars, while they are behind the ordnance in respect to the other three elements, i. e., the 8, 10, and 12 inch guns. Moreover, it will be noted that the disparity in the rate of construction exists not only as between the work of the two bureaus immediately concerned, but, in the Ordnance Department, between the two items of guns and carriages, the number of guns being much larger than the number of carriages for them. And just here it will be well to note that the progress of work upon the emplacements is entirely dependent upon the progress of work on the carriages, not on the guns.

The engineers can not determine, except within certain limits, what kind of emplacements to construct, and they can not at all determine the kind of platform to put in them until the Ordnance Bureau has determined what kind of a carriage is to be built for the guns that are to be mounted in these emplacements. So much for the existing condition. Now let us look a little into the future, in the light of the estimates before the committee. If the current estimates for ordnance and engineering work should be allowed in their entirety, we may anticipate that by the end of the next fiscal year—by the 30th of June, 1897—the engineers will have completed sixteen emplacements for 8-inch guns, and that the Ordnance Department will have ready at least sixty-two 8-inch guns. I say "at least," because in addition to the guns to be manufactured by the Ordnance Department, the Bethlehem Iron Company is under contract to deliver one hundred guns by the year 1903, of which twenty-five are to be 8-inch, fifty to be 10-inch, and twenty-five to be 12 inch guns.

How many they will deliver within a given time I do not know, but they have now completed, I believe, about ten. For these guns there would have been built or be building sixty carriages. Of the 10-inch gun emplacements the engineers will have completed thirty-nine and the Ordnance Department will have on hand at least sixty-three guns and fifty-three carriages built or building. For the 12-inch gun the engineers will have eleven emplacements and the Ordnance Department will have ready forty-three guns and twenty-one carriages. The engineers will have completed one hundred and twelve emplacements for the 12-inch mortar, while the Ordnance Department will have ready one hundred and forty-six mortars and one hundred and forty carriages for them. Thus it appears that the present estimates, if allowed in full, would still further increase the disparity already noted as existing.

It may be asked how it happened that the Secretary of War passed estimates which would lead to such a conclusion; in other words, why did he not reduce the ordnance estimates or increase the engineer estimates? The reason is this: In the first place, in making its annual estimates for the armament of fortifications, the Ordnance Department has a very definite guide to follow. It has a certain plant to operate in the manufacture of guns, carriages, and projectiles. It knows with exactness what it will cost to run these plants at their full capacity for eight hours per each working day throughout the year. So long as necessary work remains to be done by this Department the money allotted to it is expended judiciously and economically only when its plants are worked to their normal capacity, since the cost of each item increases in a certain proportion as the total amount of work falls below the normal.

The ordnance estimates, therefore, could not be judiciously reduced, except in respect to those items the purchase or manufacture of which the Secretary of War did not at the time approve. On the other hand, the Engineer Department has no such guide in the preparation of its annual estimates. Without any increase in its office force, this department can judiciously and economically expend a sum ranging between a comparatively low and a very high limit. In fixing the limit for any one year, it must be largely guided by legislative action on this matter in preceding years. And as, when these estimates were acted upon by the Secretary of War, the general condition had not changed from that of last year, he did not feel justified in increasing them.

In the second place, assuming that the estimates would receive about the same legislative action this year as they had received last year, the Secretary hoped that this action would be so guided as to reduce the disparity in the rate of construction which he had pointed out in his annual report. He therein stated that this disparity should continue no longer than was necessary, and that steps should now be taken to provide carriages and emplacements for all the guns that had been built. I shall point out in a moment why it was that such a recommendation was then for the first time warranted. If Congress were willing to grant the money necessary to bring up the quota of carriages and emplacements, estimates therefor could at once be laid before it. But if the estimates were to be reduced by legislative action as they had been in recent years—that is, by from two-thirds to three-fourths—he hoped that by calling attention to this disparity the reduction would be so made as to enable the engineers to complete the maximum amount of work.

As I said before, in the absence of such a condition of affairs as would justify the hope that Congress or this committee would for a moment consider the propriety of granting the estimates in their entirety, the only warrantable assumption was that legislative action would be about the same as last year, modified, however, by the suggestions in the Secretary's report. Let us suppose this to have been done, and that the ordnance estimates have received about the same action as last year, while the engineer estimates have been wholly allowed. In that event, if the engineer work should be carried on as contemplated when the estimates were made, there would be provided a considerably larger number of emplacements for the 12-inch mortar than there would be mortars and carriages to put in them, while the number of emplacements for 8, 10, and 12 inch guns would be substantially equal to the number of carriages ready for them.

This is on the supposition that, as last year, no money would be allowed to build mortars or carriages for them, and only enough for a very few gun carriages. But in proportion as money is allowed for mortars, and for gun and mortar carriages, the disparity would continue, and could eventually be remedied only by largely increased appropriations for emplacements. Now, a few words as to how this disparity in rates of construction has come to exist. When Congress, in 1888, made the first large appropriation for the modern armament of fortifications, the War Department was at once ready to build or buy the best 8, 10, and 12 inch guns in the world. In fact, it was ready to build better guns than were mounted anywhere on board ship—that is, caliber for caliber—because, not being limited by considerations of weight, the guns could be made heavier, could fire heavier projectiles, so that for anything like the same velocities they would have greater ballistic power.

But this was all that it was then ready to do—to build, through its Ordnance Department, 8, 10, and 12 inch guns and 12-inch mortars, and to guarantee that they would be the best in the world. The Endicott Board in 1886, the subsequent Board of 1890, and the Board of Engineers (whose special duty it is to study the problem of fortification), while differing as to details in their conclusions, have all substantially agreed as to the ballistic energy necessary for the artillery defense of the twenty-seven or twenty-eight ports considered by them. This ballistic energy is represented in each case by a certain number of guns and mortars. But this number is based upon the assumption that the guns will be mounted in a certain way; in short, that a large proportion of them will be mounted on disappearing mounts.

If a gun can be so mounted that every time it is fired it disappears from the view of the enemy and remains concealed during the time necessary for loading, one gun

may be made to do the work of several mounted on the nondisappearing principle, both because the casualties to the gunners will be much less and the chance of the gun itself being injured or disabled will be much smaller. Therefore it must not be forgotten that when, from time to time, boards have reported to Congress that a certain number of guns is necessary for the artillery defense of the coast, that number involves, as an absolute *sine qua non*, that a certain proportion shall be mounted on disappearing carriages or in some method embodying the disappearing principle. But at the time that the first large appropriation was made, in 1886, no such carriages had ever been made in this country, and those in use abroad were not considered satisfactory enough to warrant their adoption here.

The determination of satisfactory types of such carriages was therefore a matter of experiment. But the War Department assumed that it was only a question of time before they would be devised, and in the meantime, as there was no doubt as to the guns and nothing was to be gained in respect to them by delay, it steadfastly urged Congress to go on with the work of building the guns and let appropriations for the carriages and emplacements (except for experimental work) wait for a time. Within not much more than a year preceding the Secretary's report the Ordnance Department has solved the problem of a disappearing carriage for the 8 and 10 inch guns, and the engineers have designed the emplacements and platforms accordingly.

The War Department is now ready to build or buy the carriages and construct the emplacements as rapidly as Congress shall determine the work to go on. The time consumed by experiments on this matter of disappearing carriages accounts in part for the discrepancy between the existing number of guns and emplacements. It does not entirely account for it; a great deal of it is due to the fact that in reducing estimates sufficient attention has not been given to seeing that the amounts allowed for the two Departments shall accomplish properly proportionate amounts of work. Still, it may be said in a general way that the emplacements have had to wait upon the carriages, and that the carriages have had to wait upon the results of experiments and tests.

At this moment, however, the only problem connected with the mounting and emplacing of all the 8 and 10 inch guns that have been built or provided for is a financial one. But in reference to the 12-inch gun, the case is somewhat different. The Endicott Board recommended two hundred and three of these guns, a considerable part of which were to be mounted on the disappearing principle. The only practicable way then known or anticipated of applying this principle to guns of such weight and ballistic power as the 12-inch gun was by the use of what is known as the "gun lift." This method, while sufficiently satisfactory from the engineer and the artillery point of view, is exceedingly unsatisfactory from the financial point of view. So much so is that the case that the engineer and ordnance officers have devoted a great deal of study and labor to the solution of the problem of a 12-inch disappearing gun carriage that would permit an all-around fire.

The engineers and the ordnance officers, the War Department, and Congress have believed that this can be done; that it is only a question of time—of giving American inventive genius an opportunity to work. Therefore the Department has not asked and Congress has not contemplated any considerable number of gun-lift emplacements for the 12-inch gun. And so, to sum up this part of the subject, Congress now has it in its power for the first time to remedy the disparity in the rate of construction of 8 and 10 inch guns, carriages, and emplacements, because on these items the Department is prepared to expend judiciously and economically any amount of money that Congress is willing to give; but for those 12-inch guns requiring an all around fire the number of carriages and emplacements will have to remain below the number of guns until a satisfactory disappearing carriage shall have been devised.

Mr. CANNON. Just at that point, before you strike another thing, to have the statement all together—the Chief of Ordnance spoke with great certainty that a 12-inch carriage was now practicable.

The CHAIRMAN. That was not all round fire, only 170°.

Mr. CANNON. Is not that the fact?

Captain BLISS. No, sir; that carriage can not be used with all the 12-inch guns which the Endicott Board designed to mount on gun lifts, and the reason is this: There are certain sites where it is necessary to secure protection against an attack on the complete circle of 360°. If a 12-inch gun can be put in, so mounted that after it has been loaded under cover it can be traversed so as to point, say, in that direction [illustrating], and again traversed so as to fire in this direction [illustrating], or in any direction you please—if, I say, such a mode of emplacement for the gun can be devised—one gun may be sufficient; but if we can fire only over an arc of 170°, say in that direction [illustrating], then this side will have no protection, and therefore if we have to use a carriage which will permit firing only over that degree of arc, it will be necessary to put in at least two guns, one to fire in that direction and one to fire in this [illustrating].

In that case the cost of the additional emplacements, carriages, and guns will so

nuch increase the total cost of fortifying such sites as to make it very desirable to wait, in the absence of such an emergency as would make financial considerations of secondary importance, until a satisfactory type of an all-around disappearing carriage can be obtained for the 12-inch gun before continuing work on emplacements for them.

Mr. SAYERS. I understand you to say it has not been until the past year that the Ordnance Office has been able to secure a satisfactory disappearing carriage for the 8 and 10 inch guns?

Captain BLISS. Practically; yes, sir. At least it was in its report of a year ago last October that the Board of Ordnance and Fortification first reported that these carriages had satisfactorily passed all the tests.

Mr. SAYERS. Now, do you know whether or not the Ordnance Department regards the carriages for the 8 and 10 inch guns that have been adopted as the most perfect type?

Captain BLISS. Yes; those that have been adopted.

Mr. SAYERS. And they are entirely satisfactory?

Captain BLISS. Not only satisfactory, but there is no doubt that they are much better than any other disappearing gun carriages that have been built anywhere.

Mr. SAYERS. And they have been subjected to such experiments as to justify that conclusion?

Captain BLISS. Yes, sir. Experiments have been conducted with these carriages, I can not say exactly how long, but for several years—four or five years.

Mr. SAYERS. And the only problem to be solved now is to obtain a disappearing carriage for the 12-inch gun, which will complete the entire circle?

Captain BLISS. Yes, sir. And the Chief of Ordnance, I believe, feels sure that he has a satisfactory design for such a carriage, but it has not been built or tested yet, so the type has not yet been established on which to manufacture in quantity.

Mr. SAYERS. They have secured a type of disappearing carriage that will cover an arc of 170°?

Captain BLISS. Yes, sir.

Mr. SAYERS. So that there remains to be invented a carriage that revolves—

Captain BLISS. Over the difference between that arc and 360°. In regard to the determination of a satisfactory type of disappearing carriage, it must be borne in mind that the settlement of this question involves not merely the favorable judgment of the Ordnance Department, but it must also be passed upon by the Board of Ordnance and Fortification, which has been appointed under an act of Congress for that purpose.

Mr. SAYERS. Now, one other question and I am through. You speak of a discrepancy between the number of guns and the number of carriages and the number of emplacements. Now, is it the opinion of the Department that it will be at all advisable to cut down the appropriations for the work at Watervliet Arsenal, or ought Watervliet Arsenal to be kept at its full capacity; that is, eight hours a day during the entire year?

Captain BLISS. The Department is decidedly of the opinion that the estimates for the Ordnance Department should be allowed to such an extent as will permit that Department to work its plants in the construction of the necessary items for coast defense, for which satisfactory types have been determined, to their full capacity.

Mr. GROUT. One question. Who owns this disappearing carriage? Is it the property of the Government, or is the patent held outside by anybody?

Captain BLISS. This carriage was invented by officers of the Ordnance Department. It is an improvement and modification by Captain Crozier of the original idea of Colonel Buffington, some years ago.

Mr. GROUT. Is it patented?

Captain BLISS. The right to manufacture for the United States has been surrendered to the Department. When I say it is patented, I believe that it is. It is known as the Crozier-Buffington carriage.

Mr. GROUT. There will be no royalties as far as the Government is concerned?

Captain BLISS. None at all.

Mr. GROUT. Do you know what terms it is surrendered on, whether he demanded some sum of money?

Captain BLISS. I can determine that with accuracy as soon as I return to the Department. I am quite sure that he has surrendered to the Government the absolute right to manufacture, free of any charge.

Mr. GROUT. His services were in the Department studying out these questions?

Captain BLISS. Yes, sir.

Mr. GROUT. One question more before resuming. Who is the inventor of this 12-inch gun carriage; the same person?

Captain BLISS. No, sir; I do not think it is covered by a patent at all. I think that it has been designed by the Ordnance Department. This carriage has not yet been built, but the Chief of Ordnance is satisfied that it can be built on the designs which he now has.

Mr. GROUT. Do you know what the estimated cost of that carriage is?

Captain BLISS. The Ordnance estimate for a disappearing carriage for this gun is about \$25,000 for the front-pintle carriage (arc of 170°) and I believe about \$23,000 for the center-pintle, or all round fire carriage.

Mr. GROUT. That is for the 12-inch gun?

Captain BLISS. Yes, sir. And you can very easily see how much the ultimate cost of coast defense will be lessened when this problem is satisfactorily solved. The gun-lift emplacements for the 12-inch gun are estimated to cost about \$225,000 per gun. To emplace the total number heretofore contemplated to be mounted on gun lifts would cost something like \$29,000,000. But if a satisfactory disappearing carriage can be devised for these guns the cost of emplacement will be reduced to something like \$75,000 per gun, and in some cases might be as low as \$50,000; so that the total cost now contemplated for gun lifts would be reduced from two-thirds to three-fourths—that is, it would be reduced from some \$29,000,000 to \$9,000,000 or \$10,000,000, or perhaps even less.

Mr. GROUT. That is the problem they are trying to solve?

Captain BLISS. Yes, sir; that is part of the technical business of the Ordnance Department, and they are constantly at work upon it.

Mr. CANNON. In that same connection, I want to ask you, in the judgment of the Secretary of War, or in your judgment, in the present condition is it advisable to wait another year for the perfection of this carriage for the 12-inch gun rather than to go on and construct the additional gun lifts for this gun?

Captain BLISS. Well, sir; that question ultimately involves a financial question of great importance. As I have before said, these gun lifts are very satisfactory in every respect except their great cost. If this question of cost required no consideration so that, by a snap of the finger, as it were, you could put these guns on lifts so that they would become immediately available for defense, I should say that it ought to be done. But as they can not be put on lifts by a snap of the finger and as it is to be hoped that, if we were to begin their construction in considerable numbers now, a satisfactory disappearing carriage will be devised long before their completion and thus make them unnecessary, I do not think that it would be wise to, for the present, continue their construction. I doubt if even a great emergency would justify such a course, since it is very possible that they could not be completed in time to be of use in such emergency.

Mr. CANNON. What is the estimate for the gun lifts?

Captain BLISS. About \$29,000,000.

Mr. CANNON. Is there in this bill any estimate for a gun lift?

Captain BLISS. Not specifically for that object. The engineering estimate is always an aggregate amount for emplacements. After consultation between the chief of engineers and the Secretary of War the money which may be granted is allotted to different localities for the construction of such emplacements as may seem at that time to be the most necessary.

Mr. SAYERS. Will you complete your answer to Mr. Cannon's question upon the point of the construction of these emplacements at the present time, using gun lifts instead of waiting for the invention of the disappearing carriage which will complete an entire circle?

Mr. CANNON. Everything considered.

Captain BLISS. As I said before, if the question of money could be left out of consideration, and it being admitted that the gun-lift emplacement is a satisfactory one in all other respects, I think these guns should be put in position without further delay, because a good coast-defense system is needed now, and if there were sufficient money to complete it as now designed there would seem to be no reason for waiting any longer.

Mr. CANNON. When the disappearing gun carriage is invented, then these gun lifts would become useless?

Captain BLISS. They would not become useless; it would merely be unnecessary to construct more of them. You are to understand that the gun lift is, from an engineering and artillery point of view, a satisfactory method of emplacement for the 12-inch gun; but from a financial point of view it is not, because, in spite of any assumption which may be made for the mere purpose of argument, the money question is an all-important practical one and can not be left out of consideration.

The CHAIRMAN. Is it not true that no gun lifts are estimated for or are in contemplation by the Engineering Department under this bill?

Captain BLISS. I am not sure that that is strictly so. The engineers have completed two 12-inch gun lifts at Sandy Hook. My impression is that they have broken ground for three more on the Delaware River, which, if they should be completed, would form a principal part of the artillery defense of that river. Three more were designed for the harbor of Charleston, on which work could be begun if the solution of the problem of a disappearing carriage should appear to be too

remote. That, however, would make six, at the most, which the Engineering Department has had in contemplation, and you will note that it was for this reason that the Secretary reduced the estimate of the Ordnance Department in respect to the item of gun carriages. That department proposed to build fourteen gun-lift carriages out of the estimate for this year, which number was reduced by the Secretary of War to six in order to correspond to the total number of additional gun-lift emplacements contemplated by the engineers. Practically, however, it may be taken as an assured fact that no more gun lifts will be built, and the money given for carriages will not be spent on gun-lift carriages.

Mr. SAYERS. The gun lift is regarded as part of the emplacement?

Captain BLISS. Yes, sir.

Mr. SAYERS. For instance, the Engineering Bureau does not estimate for a gun lift separately?

Captain BLISS. No, sir; it estimates \$225,000 for a gun lift emplacement in its entirety; that is, for everything except the gun and the carriage.

Mr. SAYERS. It is merely information for the Secretary of War, so as to show what factors enter into the total estimate?

Captain BLISS. Yes, sir.

Mr. SAYERS. But under the general appropriations for emplacements the engineers could go along and construct their gun lifts?

Captain BLISS. Yes, sir; in theory they could, with the approval of the Secretary of War. But it is very well known by all that the power to do so has been and will be exercised with the greatest discretion and judgment and that work neither of this kind nor any other will be undertaken until the Engineer Department and the War Department are thoroughly satisfied that it is the proper thing to do. They are now satisfied that work on gun-lift emplacements is not the proper thing to do. In this connection I would like to revert to the question which you asked a moment ago. I know that the War Department would not think it wise to go ahead with any more work on gun-lift batteries for the 12-inch guns. Everything is now ready for the construction of 8 and 10 inch guns and 12-inch mortars, with their carriages and emplacements, as rapidly as Congress may determine. All the money which may be given for that purpose can be now expended by the War Department judiciously and economically.

When we have all of these 8 and 10 inch guns and 12-inch mortars in position, while the system of defense thereby obtained would not be perfect, it can not be doubted that a very long step will have been taken toward securing a satisfactory system. Therefore, as long as we are so far behind in these three elements, while at the same time we are ready to push the work of their construction with the greatest vigor, if Congress will only be willing to grant the money necessary for completing this part of the system without further delay, it does not seem to me that it would be wise to expend any money on gun-lift emplacements for 12-inch guns. Because before the other part of the work is completed it is quite certain that a satisfactory type of an all-around-fire disappearing carriage for that gun will be devised; it will, therefore, be then only a question of appropriations to rapidly build these carriages and the emplacements for them. Thus, by continuing as rapidly as possible work on those parts of the system which we are from year to year ready to complete, there would be no unnecessary delay in the completion of the entire system.

The CHAIRMAN. In that connection is it not true that only a small proportion of the 12-inch guns will be placed at points requiring an all-around fire?

Captain BLISS. No, sir; there are 203 12-inch guns contemplated by the approved plans for the defense of about 27 forts, and a large proportion of these were intended to be mounted on gun lifts, should no cheaper and at the same time equally good method of mounting them be devised. A large proportion of the gun lifts were planned for sites where an all-around fire from the 12-inch gun is necessary, and, therefore, any disappearing carriage which will make the gun lift unnecessary must, in an equally large proportion of cases, permit an all-around fire. There are certain places where this would not be necessary, where two 12-inch guns, so mounted that each could fire over an arc of nearly 180°, would answer the purpose. In such cases the disappearing carriage permitting a traverse of 170° can be used.

The CHAIRMAN. I understand, from testimony given before the committee, that only seven places on the entire list were of such character as required an all-around fire?

Captain BLISS. I should very much prefer that you get the expert opinion of the engineers on that subject. It is a matter involving a knowledge of technical details, while I can now speak only from general impressions. But, as I said before, I have no doubt at all that in a large proportion of cases where the gun lift has been contemplated the disappearing carriage, which will take its place, must permit fire over the entire 360 degrees.

Mr. CANNON. Now, you had not completed your statement when I interrupted you on that particular point.

Captain BLISS. After noting how the disparity in the rates of construction has come to exist and why it was not deemed necessary to call especial attention to it until comparatively recently—it being impracticable for Congress to have corrected this disparity by the appropriation of any amount of money—I will state what I understand to be the views of the Secretary of War in regard to the estimates for this year now under consideration by the committee. This disparity actually exists, and it is therefore a fact which has to be taken into consideration. If it were absolutely necessary to remedy it now it could be done only by a very largely increased appropriation over the estimate submitted to you for engineering work. The estimate of the total amount for this purpose can be readily given. And it can be easily determined how much money must be given each year in order to keep the quota of carriages and emplacements up with the number of guns, assuming any given rate for the construction of the latter.

Again, if Congress were to fix a definite sum—\$80,000,000 or \$87,000,000, or any sum which it may choose—for the completion of the entire work, and were to determine the annual rate at which the total sum should be expended, it would be very easy for the department to say in what ratio the annual allotment should be expended by the two departments immediately concerned—the Engineers and the Ordnance. To complete the entire work will require, in round numbers, about 50 per cent of the total cost for the engineering work, and about 50 per cent for the ordnance work. But if the amount appropriated varies from year to year, and in each year is very much below what can be profitably expended by the two departments, then it becomes a question of balancing considerations and determining each year according to the then existing conditions which department should expend the greater amount. The aggregate of the estimates this year for fortifications and the armament thereof is, I think, something like \$7,000,000.

The Secretary's opinion is that the ordnance estimate should not be reduced below the amount now before the committee, for the reason that such action will not only cripple the gun factory for the next fiscal year, but also for one, two, or perhaps more years thereafter, since that Department relies upon these estimates for securing the forgings upon which work will be carried on during one or more years succeeding the fiscal year for which the appropriation is made. So long as the ordnance work is not entirely completed, especially if there should appear to be reasons for completing the whole project with the least practicable delay, the War Department thinks that the ordnance estimates should not be reduced below what will enable it to run its plants at their full capacity, eight hours per day throughout the year. At the same time, of course, if the existing disparity is not to be still further increased, the engineer estimate should not be reduced.

In fact, if it were practicable to do so, the latter estimate should be so increased as to make it about 46 per cent of a total of which the present ordnance estimate would be the remaining 54 per cent; in other words, about \$5,000,000 going to the Bureau of Ordnance and about \$4,300,000 going to the Bureau of Engineers. That would be about the proper ratio of appropriations in order that the engineering and ordnance work should go on *pari passu*. If, however, it is decided to allow the estimates for the next fiscal year as they now stand, the existing disparity must still continue. In that case the Secretary of War is of the opinion that for the present this disparity should be shown by a deficiency in engineering rather than in ordnance construction, for the reason that the Government factory and existing plants throughout the country have a certain easily attained limit to the amount of work which they can do in any one year. In the absence of an increase in the plants this amount of work can not be increased by any amount of money that may be appropriated.

On the other hand, the margin is very wide before the engineers reach the limit of work which they can economically do in any one year. Therefore, in an emergency or whenever it shall appear desirable to do so, that Department can easily expend very largely increased appropriations in making up its deficiency in construction, while the Ordnance Department could not do so. Notwithstanding this, however, if it is proposed to reduce the aggregate of the estimates now submitted, the Secretary is of the opinion that under present conditions it would be advisable to reduce the ordnance estimates—not, however, to such an extent as to cripple the workings of that Department—leaving the engineering estimates to remain as they now are. The reason for this opinion is this: It is to be assumed that especially serious attention is being given to these estimates only because it may be supposed to be not altogether impossible that the sufficiency of our system of defenses might at any time be put to a practical test.

If such an emergency should occur every one of the guns which should not have been provided with a carriage and emplacement will be merely useless iron, because it can not be mounted in a hurry. If, therefore, work upon a system of defenses is not to be carried on more rapidly than heretofore it would seem to be wise to at least make available the guns and mortars which have already been provided.

Mr. GROUT. What does a 10-inch gun weigh?

Captain BLISS. Thirty tons; a 12-inch gun weighs 57 tons.

Mr. GROUT. So it is practically impossible to handle these guns in a hurry?

Captain BLISS. Yes, sir; and the carriages for these guns weigh as much or more than the guns.

Mr. GROUT. The idea of mounting them so as to be of any sort of service without an emplacement or carriage, what of that?

Captain BLISS. It is absolutely impracticable.

Mr. GROUT. I supposed so.

Captain BLISS. For that reason the Department thinks that if the aggregate is to be reduced, it should be done in such a way as to still permit this disparity to be diminished. That, of course, can only be done by allowing the maximum amount of engineering work to be completed. Therefore, if any cut is to be made, while at the same time seeking to diminish the disparity before noted, the cut would have to be made in the ordnance estimate. If the aggregate of the estimates should be passed as it now stands, the Secretary of War believes that it would be for the best interests of the Government that no change be made in the ratio of the appropriations this year asked for the two bureaus of Engineers and Ordnance. The resulting disparity in rates of construction can be remedied at any future time, whenever Congress shall so determine.

Mr. SAYERS. Suppose Congress should increase the appropriation for the engineering branch of the service over and above the estimate, are you prepared to say whether or not the Department would place these 12-inch guns which have been constructed upon lifts or would it wait until a proper disappearing carriage was completed?

Captain BLISS. Nothing further will be done in that direction. As a matter of fact, no work is being done upon these lifts, nor under present conditions is it proposed to do anything further until the problem of the disappearing carriage has been solved. It may be said very positively that no gun lifts, other than the two completed a good while ago at Sandy Hook, will ever be built.

Mr. GROUT. Unless I am somewhat at fault my recollection is that General Craig-hill expressly stated that he would not construct any more gun lifts until the question of the carriage had been solved, and I looked for it in his testimony, but I could not get my eye upon it; but I have it firmly fixed in my mind that he said so.

Mr. SAYERS. You do not think it advisable to make any larger appropriations than the estimates for the Watervliet Arsenal; in other words, the estimate is for eight hours a day for the entire year, and you would not go beyond that and have two sets of hands, so as to make sixteen hours per day throughout the year?

Captain BLISS. I should not think that was desirable in the absence of an emergency. Of course that is a matter of legislative policy. The work has to be done, and so far as regards the greater part of it, the Department is ready to do it as rapidly as Congress may direct. But the appropriation should permit the factory to run at its full capacity of eight hours a day at least, since under that condition every item of work that is turned out will be produced at its minimum cost.

Mr. GROUT. You have alluded once or twice in your statements to a comprehensive plan referring to the whole work, and I inferred, although you did not expressly say so, that you had in mind doing that under some single grant of authority from Congress. Was that in your mind?

Captain BLISS. I had in mind at the moment only the idea which has been broached in another branch of Congress, to the effect that a certain sum of money should be made available for the whole work, to be expended at a certain rate per annum—that is all.

Mr. GROUT. Now, representing the Secretary of War, let me ask what your opinion is on this subject as to the feasibility or propriety of that scheme?

Captain BLISS. In regard to that matter the Secretary of War must rely entirely upon the judgment of his expert advisers, of whom the principal one, of course, is the Chief of Engineers. The Chief of Engineers has given it as his opinion that a system of coast defense can be completed for \$87,000,000, assuming certain conditions which he imposes. That system of defense would not, of course, embody all the details of the elaborate plan contemplated by the Endicott Board and by the Board of Engineers since.

Mr. GROUT. It is a modification of that plan?

Captain BLISS. It will be a simplified plan generally, on the basis of the existing one.

Mr. GROUT. What I am after is whether or not that plan has the approval of the Secretary of War?

Captain BLISS. Yes, sir; it has.

Mr. GROUT. Did the Secretary of War appear before the Senate committee?

Captain BLISS. I do not think that he did, although I am not certain as to that.

Mr. GROUT. I do not know but that the fact is shadowed in his report.

Mr. SAYERS. Suppose that this committee should recommend to the House an appropriation sufficient to carry on the work of the Engineer Corps to the 1st of

March, 1897, with a further provision giving the Secretary of War and the Chief of Engineers, as the case might be, authority to contract for work on that branch of the service, would that be of any benefit? You will recollect that Congress will meet in December next and appropriations can be made and would be made, should authority be given, to meet the contracts as the money becomes due and payable on contract. Are you prepared to advise us on that point?

Captain BLISS. In regard to that I can only repeat what the Chief of Engineers has already said before another committee of this Congress. He has stated as his professional opinion that if he could apply the continuous-contract system in such way as he would recommend, he could save at least \$10,000,000. That is, assuming the remaining cost of the engineering work contemplated by him to be \$70,000,000, the continuous-contract system applied as he would like it to be applied would enable him to reduce that sum to \$60,000,000. I think that General Craighill has already explained to the committee that the continuous-contract system is advantageous only in case of very materially increased appropriations. He has further said, and I have no doubt that the Secretary of War concurs in that view, that after Congress should have expressed its wish that the principle of continuous contracts should apply, and should have granted the means to enable it to be applied to advantage, it should leave to the Secretary of War and the Chief of Engineers discretionary power as to its application in any particular case.

General Craighill has pointed out that in such a case as the construction of the outer line of defense for Puget Sound, far removed from sources of supply of labor and material, the Department might have to wait a long while to secure a competent contractor to undertake the work. In such cases the War Department should have the power to step in and do the work itself, if that course should seem to be preferable.

Mr. SAYERS. I will ask you another question on this point. If Congress should appropriate to the 1st of March next what is estimated to carry on the work until the 1st of March, with power to contract, then such a policy as that would be fully as effective as if the entire appropriation were made for the fiscal year ending June 30, 1897?

Captain BLISS. It seems to me that it would be so, always bearing in mind what has just been said as to the necessity of sufficiently large appropriations to make the continuous-contract system an advantageous one. I suppose that the power to contract would be limited, of course, to some specified figure?

Mr. SAYERS. When you go to your office I wish you would consider that point thoroughly, and then write Mr. Hainer a letter upon the subject.¹

The CHAIRMAN. In that connection, however, the power to contract should not be made indefinite, extending over an indefinite period or over an enormous sum.

Mr. CANNON. And in that same connection, if the chairman and other gentlemen will allow me, I would like to have this information: When you speak of \$87,000,000 to complete this work, that is scattered through how many years?

Captain BLISS. Well, it can be scattered over just as many years—

Mr. CANNON. Is it scattered over eight, ten, or what number of years? What number of years did General Craighill say it would be scattered over?

Captain BLISS. I do not remember that he has stated any definite number of years, except as may be implied in his statement that his Department can profitably and economically expend \$1,000,000 a month on engineering work. At that rate his part of the work would be completed within five or six years. For the Ordnance Department to complete the armament will, with present facilities, require about eight years for the 8, 10, and 12 inch guns, and about nine years for the 12-inch mortars. This includes the completion of the carriages, as well as of the guns and mortars. The engineering work could, if it were desired, be completed in a much shorter time than the ordnance work, for the reason before given, viz, that the engineering department can profitably expend within a given time a very much larger sum than the Ordnance Department.

Mr. CANNON. I would like to have this, Mr. Chairman, if it is the sense of your subcommittee. In addition to what Mr. Sayers asked for and separate from it, I would like to have an estimate as Captain Bliss can place it (as I know he can from the way he speaks and practical knowledge he has of it) of the amount of money that would be required per annum if you scattered this work over ten years, and of course the aggregate can easily be given. I now include the ordnance and engineer work; and then, separate from that, I would also like an estimate for the projectiles and ammunition necessary to utilize the gun that will be emplaced from year to year, and when I say the amount of ammunition I do not mean necessarily 100 rounds nor 50 rounds, but on consideration, after you have thought it over, a fair estimate of the amount in the condition of invention or manufacture of the ammunition that would probably be needed. In other words, I would like to have, separate from the estimate for this year that Governor Sayers just asked you about, a complete estimate and scheme

¹ See appended letter from Captain Bliss.

for the completion of these fortifications on the assumed cost of \$87,000,000 on the continuous contract system, which you think would save \$10,000,000, sufficiently in detail, with the words of the appropriation and limitations to carry out that scheme.¹

Captain BLISS. In a fixed period of ten years?

Mr. CANNON. I fixed ten years without meaning to be arbitrary, but wanting to do it as fast as it can be economically and desirably done. I do not say I want to do it at all, but I want that information in order that we may spread it in our hearings from that standpoint, because we are dead sure to be asked about it.

Captain BLISS. I think I understand you.

Mr. CANNON. I do not want it unless it meets the approval of the subcommittee.

Mr. HEMENWAY. That is just what I would like to have answered.

Mr. SAYERS. Now, I want to suggest this to you so you can carry the whole of it in your mind. For instance, suppose Congress intends to enter upon a continuous and somewhat rapid system of coast defense, and it should conclude to complete this defense within, say, eight or ten years. I want you to consider whether or not it would be advisable, in that event, for contracts to be made now for a longer period than two years at a time, looking to a possibility, if not a probability, of an improvement in the system.¹

Captain BLISS. Exactly; I understand you.

Mr. CANNON. Right at that point, coupling with that, however, a writing into the law of the power to contract from time to time from the standpoint of the interests of the service at the time the contract was made.

Mr. SAYERS. We will be asked upon the floor these questions, and we want to be able to answer them. We want to know the cost of the 8-inch guns, the cost of the 10-inch guns, and the cost of the 12-inch guns, and the cost of the disappearing carriage for the 8 and 10 inch guns, and then the cost of the disappearing carriage that will give an arc of 170 degrees for the 12-inch gun. Then we will want to know the cost of projectiles, powder, and other appliances for the 8, 10, and 12 inch guns.¹

Mr. HEMENWAY. Give us also the cost of the disappearing carriage as compared with the nondisappearing carriage on the gun lifts.¹

Mr. SAYERS. Give us also, then, the cost of the gun lift as compared with the 12-inch disappearing carriage.¹

Captain BLISS. Of course the answers to these questions must be based upon what the Department has recently paid, and in the event of a considerable appropriation all of them would probably be somewhat reduced.

Mr. CANNON. There is another matter I want to ask which runs in my mind. The Chief of Ordnance when before us spoke of the changed condition, so far as public sentiment was concerned, between now and the time when these estimates were made up, for instance for his Bureau. He also spoke of his opinion as to the appropriation for steel field guns and siege guns and field mortars and carriages and ammunition that could be probably prepared looking toward a reserve for 300,000 or 400,000 men in the event they were called into service for real fighting, such as a careful, prudent Government ought to have, or a careful prudent man would if he was running his own business, and he submitted some estimates of cost, etc. Now, has your attention been called to that?

Captain BLISS. Yes, sir.

Mr. CANNON. I want to know about that.

Captain BLISS. Those are all items which it is absolutely necessary to provide, but the Secretary of War does not think that they properly belong under the head of "Armament of fortifications." Of course it is very necessary, in the event of an enemy landing on our coast, that we should be able to fight them after they get there, but that is a contingency that need not worry anybody very much. If that event happens it will be equally or more necessary for us to have a sufficient number of small arms, the cost of which might just as properly be made a part of the first cost of our coast-defense system as it would be to make the field guns, etc., a part of the first cost of that system.

Mr. CANNON. In that connection would we not be much better off with the small arms than with the field and siege guns, where we are absolutely without provision?

Captain BLISS. I think that just now the question of small arms is of more importance than that of the field and siege guns. We have already got a number of steel breech-loading field guns, sufficient at the ordinary ratio of guns to men in a country such as ours, to equip an army of perhaps from 75,000 to 100,000 men, and we have a lot of old material left which is not absolutely worthless, although of course not worth much. But we have comparatively a small number of the new magazine rifles.

Mr. BARTLETT. Is that the new rifle—the Krüg-Jorgensen?

Captain BLISS. Yes, sir.

Mr. BARTLETT. Is it true that that rifle is a comparative failure?

¹ See appended letter from Captain Bliss.

Captain BLISS. Oh, no; it is vastly better than the gun we had before.

Mr. CANNON. In that connection we asked the Chief of Ordnance on that point, and he gave us the opinion, subject, of course, as far as recommendation was concerned, to such revision as the Secretary of War might approve; and he took the scheme, as I recollect it, with the intimation or statement that he would bring it particularly to the attention of the Secretary of War and we would hear further from him. I want to call your attention to it now, that we may exhaust it from a practical standpoint, and find out from you whether it is necessary to make that, say, \$200,000, \$300,000, or \$400,000 appropriation.

Captain BLISS. As I stated before, it is very desirable that such an appropriation should be made, for it is absolutely necessary that we should have all this material. But you must bear this one thing in mind: I suppose that everyone in the United States, if called upon to give money for the completion of a scheme of coast defense, will fix in his mind a certain sum as being the total which he believes that scheme will cost. He may fix it at \$80,000,000, or at \$87,000,000, or at \$100,000,000, but everybody would probably be guided by some ultimate figure which he believes to be the result of an expert estimate, whether it be the estimate of the Endicott Board, or of the Chief of Engineers, or of a committee of Congress. But it must be noted that these estimates include nothing but guns, mortars, carriages, and submarine defenses. Those are the various items which alone are included in the various estimates which have been made, one or the other of which each person keeps in his mind as a guide.

Mr. CANNON. It does not include ammunition?

Captain BLISS. No; nor field guns, nor anything of that kind. Now, if you fix by law a sum, say \$87,000,000, as that which is to be ultimately expended on the project for coast defense, the Chief of Engineers makes his estimate in the light of that total, so as to expend about 50 per cent of it. But the Chief of Ordnance, who should also have about 50 per cent of that total, asks and receives each year appropriations for field and siege guns, and mortars, and carriages, and powder, and projectiles, which are granted him out of the ultimate total of \$87,000,000. Therefore, by the time that sum is expended, a considerable part will have gone for items which were not included in the original estimate for the entire scheme. To complete that scheme, the War Department will still ask you for more money, and you will say, "We have given you the \$87,000,000 which you at the outset said that the scheme would cost, and—"

Mr. CANNON. I do not care under what head you appropriate; I am only trying, so far as I can, to get ready to answer and meet the public exigency as a sensible man would, and I do not care whether it is under one head or another head. But you say the Endicott Board spoke of guns and emplacements, and nothing else. Now, guns and emplacements do not amount to much of themselves, and on the basis of \$70,000,000 or \$80,000,000, it seems to me, if you are going to provide for finishing up the scheme in a term of ten years, that you want to take into consideration—whether the Endicott Board dealt with it or not—the cost of the projectiles; and in providing for the guns and emplacements you want also, if you enter upon the scheme, to provide for the projectiles, because that is a very large cost, is it not?

Captain BLISS. It would cost many millions to provide 100 rounds for each gun and mortar when in position. Of course, it would not cost anything like that to supply sufficient ammunition for what we have got. The point is this: ammunition is an expendable article, and, so far as the powder is concerned, a perishable article. A certain amount of this ammunition—all of which will have been charged to the first cost of coast-defense system—will be expended each year in practice. Of course, armor-piercing projectiles will not be so expended; they are procured solely for use in war and may very properly be considered as one of the permanent elements of the system, just as the guns and carriages. But the other projectiles and the powder will be subject to expenditure, and even if an ample supply were now appropriated for, before long it would have to be renewed, even in time of peace. It should no more be charged as a part of the first cost of the system of defenses than the coal which is consumed in operating the Watervliet Gun Factory should have been estimated for as a part of the first cost of that plant. In other words, it is not an item in the original estimate for the plant, but is one of the fixed charges incident to the operation of the plant.

Mr. CANNON. I understand, but it is an element of the cost, and if you fix a scheme for this work, it seems to me this ought to be taken into consideration.

Mr. SAYERS. I wish you would also put down, in connection with the cost of the 8, 10, and 12 inch gun, the cost of the mortars, the mortar carriages, and the cost of projectiles, including powder.¹

Captain BLISS. I will give you all of those items.

Mr. CANNON. When can you have all of these statements?

Captain BLISS. It will take a day or two, at least twenty-four hours.

¹ See appended letter from Captain Bliss.

Mr. CANNON. By Monday will be time enough.

The CHAIRMAN. The Chief of Ordnance came before us at our request and made suggestions; one of them authorizes the Secretary of War to procure, by purchase or manufacture, oil-tempered and annealed steel for high-power coast-defense guns of 8, 10, 12, and 16 inch caliber; for purchase and manufacture of carriages for mounting seacoast guns of 8, 10, and 12 inch caliber; for purchase and manufacture of steel breech-loading mortars of 12-inch caliber; for purchase and manufacture of carriages for mounting 12-inch seacoast mortars; for steel armor-piercing shot for seacoast breech-loading guns; making a total of \$3,896,000, provided that there should be appropriated for expenditure for these purposes up to March 1, 1897, a total of \$1,729,000. That, of course, contemplated a certain equipment of guns, carriages, etc.

Taking that into consideration as favorably acted upon by Congress, taking also into consideration the various arms of our defense on July 1, 1896, I ask you what should be the corresponding appropriation for the engineering branch of the service, what amount could be profitably placed under contract, and what amount of money should be properly specified to be expended by March 1, 1897, in order to bring the several items of coast defense in some reasonable kind of correspondence, having in view both the present and the future—in fact, all the circumstances of the case? Not asking of course a perfect correspondence, but bringing them on terms of reasonable equality, taking into consideration all the circumstances of the case.¹

Captain BLISS. In regard to that I will prepare and submit to you a written statement.

The CHAIRMAN. Now, in that connection also we would like to have a tabulated statement of the appropriations made since 1888 for the purpose of carrying out the provisions of the Endicott Board, stating separately the amounts appropriated for the engineering branch and also separately the amounts appropriated for the ordnance branch of the service.¹ Now, there are two other questions I would like to have answered; you can answer them now if you desire, or extend them when you receive the notes.

Captain BLISS. Those last two I will have to look into.

The CHAIRMAN. These are the questions: First, what increase in the Army will be necessary, particularly in the artillery arm, in order to effectually man the coast defenses when completed at the twenty-seven ports; second, if the work is prosecuted so as to complete it within ten years, when will it become necessary to increase the artillery arm of the service? I suppose you will want a little time to answer these, and when the notes are extended you can insert your answers if you so desire. Now, have you any other considerations to suggest, Captain?

Captain BLISS. No, sir; I think if I have made the Secretary's views clear to you in regard to the special matter mentioned in the telegram, I have nothing further to suggest to the committee. The Secretary directed me to say to you that he wished me, if you so desired, to place myself at your disposal in respect to any information which you may wish to obtain, whether in the committee room or outside.

The CHAIRMAN. You will see that our purpose is to make all the appropriation to meet reasonably the demands of the public service and to do it intelligently, economically, and patriotically, and of course we desire to present a bill which will make as nearly symmetrical as possible an important branch of the public service.

Captain BLISS. I shall be very glad, Mr. Chairman, to do whatever is possible to assist you in carrying out your views. I think I understand the questions that you have asked, and when I have received the stenographer's notes I will prepare answers in full in the form of written statements.

The CHAIRMAN. On behalf of the committee, I extend to you our thanks for your information and courtesy, and also to the Secretary.

WAR DEPARTMENT, OFFICE OF THE SECRETARY,
Washington, March 14, 1896.

SIR: In compliance with the request of your committee, I have the honor to communicate to you the views of the Secretary of War in regard to the subject-matter of the questions proposed by the committee at its session of Friday, the 6th instant.

Some of these questions relate to rates of construction, on the assumption that a certain scheme for coast defense is to be completed for a certain fixed sum and, providing it be completed within a given term of years, at certain annual rates of expenditure.

Prior to any further statement, therefore, and for the clear understanding of the committee, the Secretary of War thinks that it will be well to lay before you a

¹ See appended letter from Captain Bliss.

general statement showing, as far as practicable, the scheme in regard to which there is substantial agreement, and which can be completed for about the sum specified in one or more of the committee's questions. This is the plan which the War Department recommends to Congress as requiring completion as rapidly as the money, consistently with its judicious expenditure, can be provided.

But it must be distinctly understood that the omission of those items in regard to which there is no entire agreement, without substituting others in their place, gives us a general plan which is not perfect and complete, though it is believed that, in comparison with our present condition in this respect, it will afford a fairly reasonable and satisfactory degree of protection to our coasts. Being completed, we could safely wait for the proper settlement of the ordnance questions now in doubt and under discussion. Sooner or later these questions will demand an answer. Their solution may necessitate additions to the plan which is now ready for execution, though they will not modify it otherwise. Congress may be assured that the means which may be granted for completing the scheme now proposed will provide a system in regard to no component part of which is there the least doubt among experts. Whether future years shall decide a certain number of 16-inch guns to be necessary, or that instead of them their equivalent value in 12-inch guns should be added; or whether, as a result of new inventions, neither 16-inch guns nor additional 12-inch guns will be necessary—these are questions which the War Department can not now decide, nor is it necessary that Congress should consider them in connection with the plan which the War Department now recommends.

In 1886 the Endicott Board recommended to Congress the emplacement of a certain number of guns and mortars as necessary for the artillery defense of our principal seaports. A subsequent Board (commonly known as the Puget Sound Board) in 1890 proposed some alterations in the proportion between the various calibers, due largely to its suggested omission of the 16-inch guns. Subsequent special boards, charged with the duty of making detailed examinations of sites and of preparing detailed plans, from time to time still further modified the proportion between the calibers. The development of the 12 inch mortar as an accurate, powerful, and relatively cheap weapon, led to a considerable increase in its proposed number. On the other hand, the increased power of the 8, 10, and 12 inch guns, due to improved models, methods of mounting, and powders, permitted a considerable reduction in the numbers originally proposed for them by one or the other of the two boards which had reported on this subject to Congress.

These elements, viz, the 8, 10, and 12 inch guns and the 10 and 12 inch mortars, are those in regard to which there is no difference of opinion, and the emplacement of which forms the plan of coast defense to which the War Department gives its unqualified approval. As before stated, the 16-inch gun—which, in a reduced number, has been retained by the special boards in the preparation of their detailed plans—is still a matter of doubt and discussion. Questions incident to its adoption or rejection must be left to the decision of future years.

But these questions can be determined only by the test of a gun yet to be built. Its construction will cost a sum which is insignificant in comparison with the interests involved. For this reason, and because it will require three years to build and test the gun, the Secretary of War approved the estimate of the Chief of Ordnance for the purchase of one set of forgings for a 16-inch gun.

The number and kinds of guns and mortars which it is proposed to put in position; the methods of emplacing them; the number of guns, mortars, and carriages, already provided for; the cost of the remaining items; and the cost of emplacement will appear from the following statement:

GUNS AND MORTARS.

Two hundred and three 12-inch guns needed:

24 on non disappearing carriages; 179 to be mounted on the disappearing principle—

Completed or partially completed by the Ordnance Department	46
Bethlehem Iron Company contract.....	25

71

Still unprovided for, 132, to cost..... \$6,468,000

One hundred and eighty 10-inch guns needed:

18 on non disappearing carriages; 162 on disappearing carriages—

Completed or partially completed by the Ordnance Department	65
Bethlehem Iron Company contract.....	50

115

Still unprovided for, 65, to cost..... 1,950,000

Ninety-eight 8-inch guns needed:

6 on nondisappearing carriages; 92 on disappearing carriages—
Completed or partially completed by the Ordnance Depart-ment 63
Bethlehem Iron Company contract 25

88

Still unprovided for, 10, to cost..... \$160,000

Three hundred and sixty quick-fire guns needed:

Still unprovided for, 360, to cost..... 1,800,000

One thousand and thirty-two 12-inch mortars need:

Completed or building..... 86

Still unprovided for, 946, to cost..... 12,771,000

Twenty-four 10 inch mortars needed:

Still unprovided for, 24, to cost..... 192,000

Total for guns and mortars..... 23,341,000Add, for completion of guns now under fabrication by the Ordnance
Department..... 100,000Add, for appropriations that will become necessary for payments on the
Bethlehem Iron Company's contract..... 3,380,131

Grand total for guns and mortars..... 26,821,131

CARRIAGES.

Two hundred and three 12-inch gun carriages needed:

Built or building..... 10

Still unprovided for..... 193 to cost 5,404,000

One hundred and eighty 10-inch gun carriages needed:

Built or building..... 35

Still unprovided for..... 145 to cost 2,492,500

Ninety-eight 8-inch gun carriages needed:

Built or building..... 14

Still unprovided for..... 84 to cost 1,008,000

Three hundred and sixty quick-fire gun carriages needed:

Still unprovided for..... 360 to cost 2,160,000

One thousand and thirty-two 12-inch mortar carriages
needed:

Built..... 86

Still unprovided for..... 946 to cost 6,622,000

Twenty-four 10-inch mortar carriages needed:

Still unprovided for..... 24 to cost 120,000

Total for carriages..... 17,806,500

Aggregate for guns, mortars, and carriages..... 44,627,631

EMPLACEMENTS.

The estimated cost of emplacing the guns and mortars above enumerated, if it were done in the general manner contemplated by the Endicott Board, would be \$69,540,000.

But we may now safely assume a satisfactory type of disappearing carriage to be devised that will meet all the requirements of site for the 12-inch gun, and for this reason no further work will be done toward the emplacement of this gun on the gun-lift principle of the Endicott Board.

The above estimate will, therefore, be still further reduced by \$6,125,000 for case-mate emplacements, and by \$19,500,000 for gun-lift emplacements; in other words, it will be reduced to \$43,915,000. Deducting the emplacements already constructed gives an ultimate total cost of emplacing guns and mortars, as now proposed, of \$41,015,000.

Thus, the total cost of the artillery defense of the seacoast, i. e., guns, mortars, carriages, and emplacements, as now recommended, will be \$85,642,631.

But, to the cost of the engineer work for emplacements must be added about \$1,500,000 for the purchase of sites, and \$2,500,000 for submarine defenses.

This will make the cost of completing the engineer work, on the basis now proposed, \$45,015,000, or a total of \$89,642,631 for guns, mortars, carriages, emplacements (including sites), and submarine defenses.

To provide a minimum allowance of armor-piercing and deck-piercing projectiles, with powder (from 10 to 50 rounds per gun, according to caliber), and ammunition for the rapid-fire guns, with sights, fuses, and implements, will require about \$7,496,784.

Thus, if ammunition is to be a part of the first cost of the system, the total cost of completing the project herein outlined will be \$97,139,415.

As compared with the recommendations of the Endicott Board, it will be noted that the present estimate includes about \$9,000,000 (sites, ammunition, etc.) for items not previously considered in the first cost of a coast-defense system. Moreover, the enactment of the eight-hour law has increased the cost of labor and materials by from 10 to 20 per cent over that Board's estimate.

The completion of the project depends ultimately upon the maximum rate of construction of guns and mortars, that rate being the slowest in the construction of any of the items entering into the system. The quota of 8, 10, and 12 inch guns can be completed in eight years, with sufficient appropriations to attain the maximum rate at the Government factory; the quota of mortars can be completed in nine years, on the same condition; and the carriages can be completed as rapidly as the guns and mortars. But since by the end of the eighth year a very large part of the mortars and their carriages would be finished, eight years may be fixed as the minimum possible limit for the completion of the entire work.

On a basis of \$89,642,631 (the estimated cost for the only items which were considered by the Endicott and other boards—that is, excluding ammunition, etc.), this would require an annual expenditure of \$11,205,328, about equally divided between the Engineer and Ordnance Bureaus. On the basis of \$97,139,415 (the estimated cost, including ammunition, etc.), an annual expenditure of \$12,142,428 would be required, or at the rate of about 54 per cent for ordnance work and 46 per cent for engineer work.

With this preliminary statement in view, I pass to a consideration of the questions of the committee.

The general reasons leading the Secretary of War to the belief that the full amount of the current estimates of the Ordnance Department should be allowed have been stated verbally to the committee. Assuming these estimates to be allowed (which is the basis of one of the questions proposed) then, in order to preserve a due proportion for the corresponding engineer estimates, the latter amount should be from 46 to 50 per cent of a total of which the ordnance estimate is 54 or 50 per cent; that is, it should be increased to \$4,300,000 or \$5,000,000, according as the total ultimate cost is to be \$89,642,631 or \$97,139,415.

If, from the beginning, the engineer and ordnance work could have gone on *pari passu*, the above proportionate rate of expenditure would now be necessary in order to maintain an equality in the rates of construction. But, in order to bring the engineering work on emplacement up to the ordnance work on carriages by a certain date—say June 30, 1897—it will require an increase of the current engineer estimates by about \$3,375,000—that is, the current engineer estimate should be \$5,260,000.

But the number of carriages is, and with the current ordnance estimates will remain, less than the number of guns to be provided by June 30, 1897. To supply this deficiency will require the ordnance estimate to be increased by about \$1,200,000; that is, the current ordnance estimate should be \$6,076,443.

If the number of carriages and guns were thus equalized, in order to bring the number of emplacements into correspondence therewith, thus putting the three elements of guns, carriages, and emplacements on exact equality by June 30, 1897, would require an increase of the current engineer estimate by about \$5,580,000; that is, this estimate should be \$7,465,000.

In other words, to secure equality of construction by June 30, 1897, the aggregate of the current estimates for fortifications and the armament thereof should be \$13,541,443.

In the absence of such an increased appropriation the existing disparity would still continue. But, on the supposition of any fixed aggregate for expenditure by the Department for coast defenses, the disparity would decrease year by year in an increasing ratio. For, as the requisite number of any gun or carriage (allowing a very few surplus for contingencies) is completed by the Ordnance Department, the annual amount theretofore expended for that purpose could, to a certain extent, be allotted to the engineers for bringing up their deficiency in construction.

The foregoing statements, including the preliminary one, are in answer to those questions of the committee relating to the scheme of defense now recommended by the Department, and its estimated cost; the rates of expenditure, in order to complete it within a given term of years; the proper proportion to be maintained in order to prevent increasing disparity in rates of construction by the Engineer and Ordnance Departments, and the increases in the current estimates in order to correct the disparity which now exists.

To sum up, it appears that the plan involves the construction of two hundred and three 12-inch guns, one hundred and eighty 10-inch guns, ninety-eight 8-inch guns, three hundred and sixty rapid-fire guns, twenty-four 10-inch mortars, and one thousand and thirty-two 12-inch mortars, all with their carriages, at a total estimated cost for those still unprovided for of \$44,627,631. It further involves the emplacement of these guns and mortars by the engineers at a total estimated cost of

\$41,015,000. It involves, also, the purchase of additional sites for emplacements to the amount of \$1,500,000. And, finally, it involves the installation of submarine defenses at a cost of about \$2,500,000.

Thus, the total cost of the completion of the scheme, without projectiles, powders, etc., will be \$89,642,631.

If ammunition, etc., is to be charged to the first cost of the system, the procurement of the minimum amount that can be considered will require an additional \$7,496,784, making the total cost of completion about \$97,139,415.

To prevent increasing disparity in the rates of construction, the amounts hereafter to be allowed should be in the proportion of 48 or 50 per cent for engineering work and 52 or 50 per cent for ordnance work, according as the total ultimate cost is to be \$97,139,415 or \$89,642,631.

To bring the engineer work up to the ordnance work on carriages by June 30, 1897 (if present ordnance estimates be allowed), will require the engineer estimate to be increased to about \$5,260,000.

To bring the ordnance work on carriages up to the number of guns by June 30, 1897, will require the ordnance estimates to be increased to \$6,076,443.

In the event of this latter increase, in order to bring the engineer work into correspondence with the ordnance work by June 30, 1897, will require the engineer estimates to be increased to \$7,465,000.

In other words, in order that by June 30, 1897, the three items of guns, carriages, and emplacements shall be on the same plane of advancement, it will be necessary to increase the aggregate of the current estimates for engineer and ordnance work to \$13,541,443.

The views of the Department as to the applicability of the continuous-contract system to the future work on the coast defenses are as follows:

Engineer work.—The sum—\$2,000,000, in round numbers—asked for by this Department in the regular estimates for batteries and platforms was intended to be distributed over seventeen places, in amounts ranging from \$4,000 to \$280,000. Were this sum granted, it was the expectation of the Chief of Engineers to spend all of it by June 30, 1897. The Engineer Department habitually uses the contract system whenever the circumstances justify, but there are cases where, due to isolation of the locality, the smallness of the sum available, or other conditions, this system is not believed to be the best.

Nor is it believed that the continuous-contract system has any special advantages unless the sum to be spent in any one locality exceeds a certain limit. The experience of the Chief of Engineers leads him to place this limit at the amount of \$250,000 to be spent in not more than twelve months. For any larger sum the continuous-contract system is economical and advantageous.

If, therefore, Congress limits itself at this session to the consideration of the regular estimates for the Engineer Bureau—about \$2,000,000—the use of the continuous-contract system is not to be advised, though, out of that sum, the Bureau would make contracts of the usual kind for materials at each specified locality.

But if Congress should grant the current engineer estimates for expenditure before, say, March 4, 1897, and should authorize contracts to be entered into in anticipation of annual appropriations to one or another of the amounts before given as desirable for the prosecution of this part of the work, continuous contracts would be made for work extending to June 30, 1898. The Chief of Engineers is confident that the experience gained between now and the date just mentioned, the creation and accumulation of contractors' plants, and the rivalry excited by this larger operation, would enable the Department to make new contracts thereafter on better terms for the United States. Contracts for this work should not be made for a longer term than two years.

Ordnance work.—All money appropriated for this work, over and above what is necessary to run the Government plants at their full capacity of eight hours per day throughout the year, can be economically and advantageously expended under the "continuous" contract system. All work for field and siege material, for all carriages, projectiles, and generally for supplies other than heavy guns and mortars, which may be in addition to what can be done at the Government factories, can be advantageously contracted for.

In this connection it is recommended that the law appropriating money for the further prosecution of engineering and ordnance work on coast defenses should, with the usual preamble, say, "to be expended under the direction of the Secretary of War and the supervision, respectively, of the Chief of Engineers and the Chief of Ordnance, each as to the work of his own department as now required by existing law, to be at once available and to continue available until expended, unless otherwise directed by law; and the Secretary of War is authorized in the expenditures under this law to use the contract system, continuous or otherwise, or to dispense with both, as in his judgment the special conditions in each case lead him to conclude would be most advantageous and economical for the United States."

Appropriations made from 1888 to date toward carrying out the recommendations of the Endicott Board.—These appropriations are shown in the following tabulated statement.

Act.	Appropriations made since 1883 to carry out the recommendations of the Endicott Board, i. e., to procure guns, mortars, carriages, emplacements, and submarine defenses.							For items not estimated by Endicott Board.		Total carried by appropriation act.
	Engineering.			Ordnance.				Sites.	Miscellaneous (ammunition, field material, etc.)	
	Gun and mortar emplacements.	Gun and mortar platforms.	Gun and mortar casemates.	Submarine mining material.	Gun carriages.	Mortars.	Mortar carriages.	Forgings.	Finishing and assembling.	
September 22, 1888				\$22,081.08		\$250,000.00		\$1,500,000.00	\$35,000.00	\$2,081,018.92
March 2, 1889				250,000.00			\$100,000.00			1,289,584.00
August 18, 1890*	\$1,221,000.00			100,000.00		400,000.00	225,000.00		70,000.00	1,616,835.00
February 24, 1891*	750,000.00			50,000.00				800,000.00		1,454,803.00
July 23, 1892	500,000.00					100,000.00	200,000.00	800,000.00	125,000.00	1,447,876.00
February 18, 1893		\$50,000.00			300,000.00			600,000.00	175,000.00	742,813.00
August 1, 1894	400,000.00	100,000.00			100,000.00		100,000.00	250,000.00		564,754.00
March 2, 1895	400,000.00	100,000.00		20,000.00	100,000.00			200,000.00	225,000.00	514,957.50
Total	3,271,000.00	250,000.00	502,081.08	478,000.00	800,000.00	750,000.00	625,000.00	4,150,000.00	875,000.00	9,713,651.42

Total for engineering \$4,501,081.08
 Total for ordnance 7,200,000.00

Aggregate of engineering and ordnance to carry out recommendations of Endicott Board.....

Balance of appropriations for sites and miscellaneous 11,701,081.08

11,588,681.42

* These two acts carried authority for one hundred 8, 10, and 12 inch guns to be manufactured under contract. This contract was let to the Bethlehem Iron Company for \$2,580,373.25. When this obligation shall have been met (1903) the above total will have been increased to \$2,820,105.75, and the aggregate for engineering and ordnance to carry out the recommendations of the Endicott Board* will have been increased to \$15,281,434.33, leaving a balance that will have been expended for "sites and miscellaneous" of \$11,538,451.42.

Saving effected by emplacement of 12-inch guns on disappearing carriages, as compared with the cost of their emplacement on gun lifts.—The emplacement of 12-inch guns on gun lifts, as originally contemplated—there being at the time no other practicable method of mounting them on the disappearing principle—would cost the estimated sum of \$29,250,000, the estimated cost of emplacement per gun being \$225,000.

The substitution of the disappearing carriage for the gun-lift mount will involve an emplacement costing not more than \$75,000, making a total cost of \$9,750,000 for emplacement. A satisfactory disappearing carriage for this gun that will meet all the requirements of sites will, therefore, result in a saving of \$19,500,000. Such a carriage the Ordnance Department will soon be ready to supply.

Cost of items entering into the coast-defense system.—The cost of these items is shown separately in the following statement:

GUNS.

5-inch rapid-fire gun.....	\$5,000
8-inch	15,218
10-inch	29,883
12-inch	48,963

GUN CARRIAGES.

5-inch, rapid-fire.....	6,000
8-inch, nondisappearing.....	9,000
8-inch, disappearing.....	12,000
10-inch, nondisappearing.....	10,500
10-inch, disappearing.....	16,500
12-inch, nondisappearing.....	12,500
12-inch, disappearing (170° arc of fire).....	25,000
12-inch, gun-lift carriage.....	14,500
12-inch, casemate carriage.....	25,500
12-inch, disappearing, all-around fire (estimated).....	28,000

MORTARS.

10-inch mortar.....	8,000
12-inch mortar.....	13,500

MORTAR CARRIAGES.

10-inch.....	5,000
12-inch.....	7,000

EMPLACEMENTS.

For 5-inch rapid-fire gun.....	4,000
For 8-inch gun.....	50,000
For 10-inch gun.....	50,000
For 12-inch gun, nondisappearing.....	50,000
For 12-inch gun, disappearing.....	75,000
For 12-inch gun in casemate.....	200,000
For 12-inch gun on lift.....	225,000

MMUNITION PER ROUND.

8-inch B. L. rifle (steel):	
Powder.....	44.55
Cast-iron shot.....	17.00
Steel A. P. shot.....	120.00
Cost per c. i. shot round.....	61.55
Cost per steel A. P. shot round.....	164.55
10-inch B. L. rifle (steel):	
Powder.....	92.40
Cast-iron shot.....	24.40
Steel A. P. shot.....	230.00
Cost per c. i. shot round.....	116.80
Cost per steel A. P. shot round.....	322.40
12-inch B. L. rifle (steel):	
Powder.....	161.70
Cast-iron shot.....	35.80
Steel A. P. shot.....	400.00
Cost per c. i. shot round.....	197.50
Cost per steel A. P. shot round.....	561.70

12-inch B. L. mortar (cast-iron, hooped):

Powder.....	\$26.40
Cast-iron shell.....	34.50
Steel D. P. shell.....	175.00
Cost per round.....	60.90
	or 201.40

12-inch B. L. mortar (steel):

Powder.....	34.65
Cast-iron shell.....	34.50
Steel D. P. shell.....	175.00
Cost per round.....	69.15
	or 219.65

8-inch pneumatic gun:

Projectile.....	215.00
Projectile charged.....	280.00

15-inch pneumatic gun:

Projectile.....	280.00
Projectile charged.....	650.00

The Crozier-Buffington patent.—The Crozier-Buffington disappearing carriage is patented for the protection of its inventors in foreign countries. But the right to manufacture in this country has been given to the United States without consideration and without payment of royalty.

What increase in the Army will be necessary, particularly in the artillery arm, in order to effectually man the coast defenses when completed at the 27 ports? And if the work is prosecuted so as to complete it within ten years, when will it become necessary to increase the artillery arm of the service?—No increase in the Army will be necessary on account of the completion of the coast defenses, except in the artillery arm.

In time of war, to provide one relief of artillerymen for all the guns and mortars—assuming all of those above enumerated to be in position—will require about 25,000 men. This number is no larger than would have been required for all the guns and mortars of the old armament. But in time of peace the strength of the artillery arm can be limited to the number necessary to properly care for the costly material which is already, in part, provided.

That number depends in part upon the amount of this material; but also, to a considerable extent, upon its distribution. When the separate works now projected shall have been completed they will amount to about 110. They are distributed in the various ports in numbers of from 1 to 10 or 12, according to the locality which they defend. They naturally divide themselves into groups, each group being determined by the special relations of importance, distance, etc., of its component parts.

It is not intended that each work, in time of peace, shall have a separate garrison; but for each group of works a central garrison will be established (some are already established) in connection with the larger and more important works, or those where barracks, storehouses, etc., will be least exposed in time of war. From these central points detachments will be sent at fixed intervals to the other works within the group for practice and for the purpose of insuring due care of the material. This obviates the expense attendant upon the maintenance of a very large number of separate and permanent garrisons.

The Department believes that 70 foot batteries, provided by a bill now before Congress, will be sufficient for the purpose mentioned. It is impossible to state at what precise moment the full number will be needed. But already the labor imposed upon the artillery arm by the installation of the new material has much increased, and the method of providing the new defenses simultaneously at nearly all the ports to be protected will require the full number of 70 batteries long before all the guns are in position.

Very respectfully,

TASKER H. BLISS,
Captain C. S., U. S. Army.

HON. E. J. HAINER,

Chairman Subcommittee on Appropriations, House of Representatives.

A. H. EMERY—DISAPPEARING GUN CARRIAGE.

COMMITTEE ON APPROPRIATIONS, HOUSE OF REPRESENTATIVES,
Washington, D. C., March 7, 1896.

HON. DANIEL S. LAMONT, Secretary of War.

SIR: I have the honor to hand you herewith two papers, marked A and B, respectively, being amendments proposed to the subcommittee in charge of the fortification appropriation bill by A. H. Emery, esq., providing for contracts with him for the construction of a 10-inch and a 12-inch disappearing gun carriage. Accompanying

the proposed amendments are typewritten statements by Mr. Emery referring to each.

Will you be good enough, after examination, to report to the committee at your very earliest convenience the judgment of your Department touching the said propositions, together with any recommendations you may see fit to make with reference thereto?

Please return inclosures.

Very respectfully,

E. J. HAINER,
Chairman Subcommittee, etc.

EXTRACT FROM PROCEEDINGS OF BOARD OF ORDNANCE AND FORTIFICATION.

WAR DEPARTMENT,
Washington, D. C., March 11, 1896.

The Board then resumed consideration of the letter of Hon. E. J. Hainer, chairman Subcommittee on Fortifications, United States House of Representatives, in regard to the amendments proposed by Mr. A. H. Emery. Mr. Emery again appeared before the Board and further explained his system of gun carriages.

The Board of Ordnance and Fortification does not recommend the enactment of the amendments proposed by Mr. Emery for the following reasons:

First. With reference to the amendment in regard to the 12-inch elevating carriage. By the act approved February 18, 1893, the Board of Ordnance and Fortification was required to allot out of its funds \$130,000 for the construction and proof of a 12-inch carriage of Mr. Emery's design. The plans for this carriage were not completely worked out at the time the appropriation bill was passed and were never approved by the Board. In its action of January 25, 1893, the Board stated as follows: "In view of the doubts in the mind of the Board as to the successful working of this carriage, as expressed in its action of December 29, 1892, it is of opinion that if Congress deem it advisable to authorize and direct the construction the appropriation should be so worded as to make the cost of the carriage and foundations payable only after their successful test and acceptance by the War Department."

The Board still adheres to the opinion thus expressed. Should the proposed amendment become a law, \$93,500 might be paid to Mr. Emery for preliminary work on a carriage, the plans for which have never been approved by experts on this class of work, and the patents for which are not transferred to the United States, although it should prove of no value whatever after completion.

The paragraph in the suggested amendment to the effect that a premium of \$4,000 per pound be paid to the contractor for every round fired at a rate of rapidity exceeding 15 rounds per hour is also objectionable. The rate mentioned has already been exceeded by two carriages of the nondisappearing type, and in the opinion of the Board there should be no difficulty in obtaining at least 20 rounds per hour from the 12-inch disappearing carriage.

It will be seen that the cost of disappearing-carriage construction has very much decreased since action by Congress was taken upon Mr. Emery's design in 1893, when it is mentioned that the estimate of the Chief of Ordnance for a 12-inch disappearing carriage and platform of another system is only \$45,000.

Second. In regard to Mr. Emery's proposed amendment to appropriate \$75,000 for the construction of a 10-inch elevating carriage, the Board does not advise any action that will require the construction at the expense of the Government of a second carriage until after Mr. Emery's system has been proved satisfactory and better than the systems now in use. The rounds for the test of this carriage will cost not exceeding \$10,000, leaving about \$65,000 for the carriage. Ten-inch disappearing carriages are now being constructed under contract for \$12,350, and it is proposed by the Chief of Ordnance to make a type center pintle carriage for \$30,000.

The premium proposed for rapidity of fire exceeding 20 rounds per hour is inadmissible, if only for the reason that a 10-inch gun has already been fired from a disappearing carriage at the rate of 40 rounds per hour.

Mr. Emery appeared before the Board and was given an opportunity of fully explaining the principle, method of operation, and details of his system. He also explained numerous detailed drawings by which were illustrated a great number of component parts.

After a careful examination and consideration of this subject, the Board is of the opinion that the system is entirely too complicated, being composed of a very large number of parts that are liable to get out of order and become disabled.

During the last five years there have been presented to the Board no less than four other systems of disappearing gun carriages, one of which has been adopted. Some of them have been tested by actual trial, and hundreds of shots have been used in

these tests. All of these systems are more simple, far less expensive, and in the judgment of this Board better adapted to the requirements of the service than the Emery system.

NELSON A. MILES,

Major-General, Commanding U. S. Army, President of the Board.

J. C. AYRES,

Captain, Ordnance Department, Recorder.

A true extract.

J. C. AYRES,

*Captain, Ordnance Department, U. S. Army,
Recorder Board of Ordnance and Fortifications.*

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